ENGINEERING AND
BOILER HOUSE REVIEW

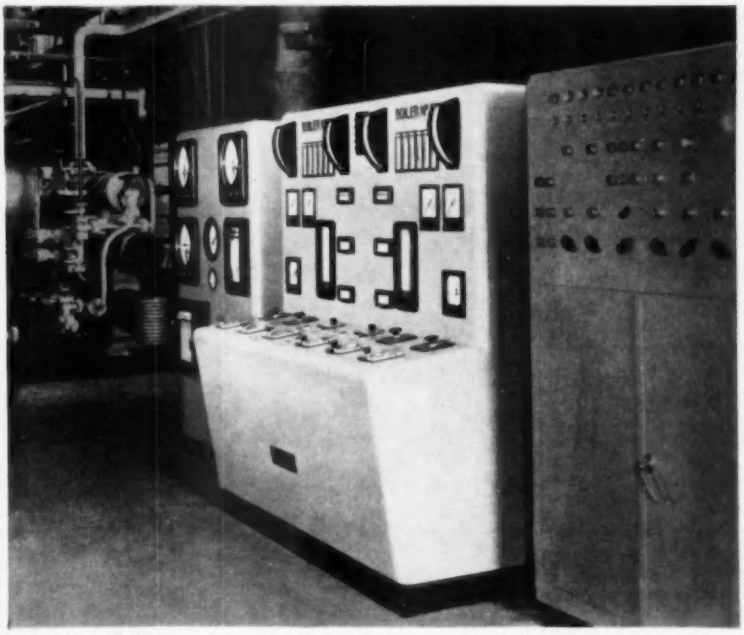
ESTABLISHED 1899

TWO SHILLINGS & SIXPENCE

VOL. 74 NO. 4 • THE PIONEER STEAM JOURNAL • APRIL, 1959

Electroflo
Meters & Controls

A TYPICAL 'profit making' INSTALLATION



2—B. & W. W.T. Boilers, oil fired, with Thornycroft burners M.C.R., 28,000 lb. /hr., 400 p.s.i.g. @ 700 F. Further particulars on application

This boiler plant costs less to run and maintain because — through Electroflo Automatic Boiler Control — it operates continuously at optimum efficiency.

The initial capital cost of Electroflo Automatic Control is invariably recovered within a few months of starting up. For further particulars, ask for Publication No. S.849.

Electroflo METERS COMPANY LIMITED LONDON N.W.10.

Head Office: Abbey Road, Park Royal, N.W.10. Telephone: Elgar 7641/8. Telegrams & Cables: Elflometa, London, Telex. Telex No. 2-3196. Factories: Abbey Road, Standard Road & Minerva Works, Park Royal & Maryport, Cumberland. Agents in all principal countries throughout the world. Member of Elliott-Automation Group.

Hydraulics for Industry

LOCKHEED ARE SPECIALISTS IN THE ENGINEERING OF COMPLETE SCHEMES FOR HYDRAULIC ACTUATION

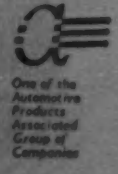
including installation and putting to work—

CENTRALISED HYDRAULIC CONTROL SYSTEMS — electro-hydraulic, power-hydraulic, manual-hydraulic.

POWER-HYDRAULIC OPERATION.

HYDRAULIC SERVO OPERATION — including 'follow-up' systems and follow equipment —

AUTOMATIC SEQUENCE PROCESS SYSTEMS.



Lockheed

REGD. TRADE MARK

DESIGNERS AND MANUFACTURERS OF A WIDE RANGE OF STANDARD HYDRAULIC UNITS

—and of special hydraulic units to customers' requirements—

SUPPLY TANKS, PUMPS, CONTROL VALVES AND OTHER VALVE UNITS,
HYDRAULIC CYLINDERS OF MANY TYPES,
ACCUMULATORS, POWER AND CONTROL CABINETS, POWER PACKS,
SEMI-ROTARY SLAVES, HYDRAULIC MOTORS,
PRESSURE SWITCHES,
ELECTRICALLY-OPERATED UNITS AND ELECTRICAL INDICATION

For further details, please write for pamphlets

Hydraulic power is positive power—controllable power

Lockheed practice is backed by a quarter of a century of Lockheed high-precision hydraulics.

For further details, please write for pamphlets and kindly mention this journal.

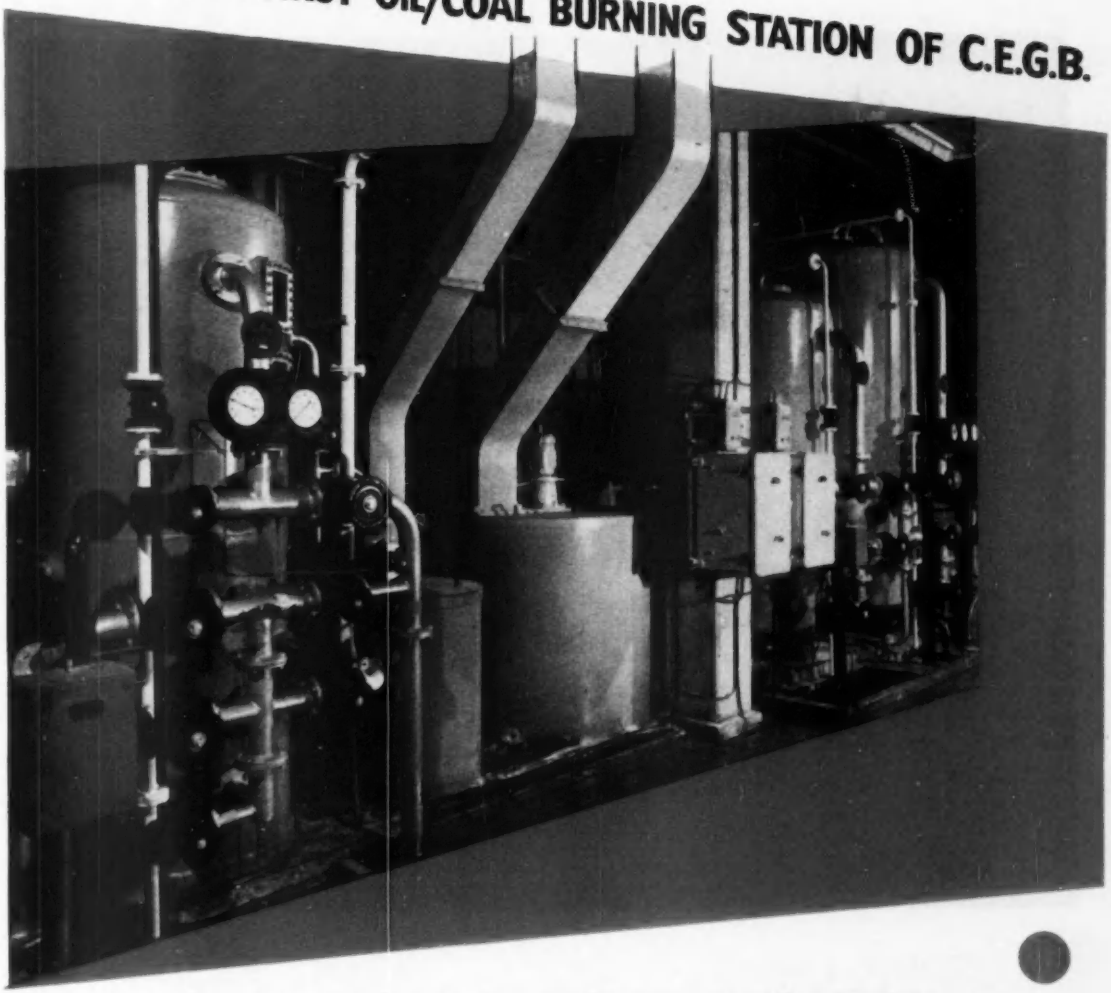
INDUSTRIAL HYDRAULICS

LOCKHEED PRECISION PRODUCTS LTD.

INDUSTRIAL HYDRAULICS DIVISION, (One of the Automotive Products Associated Group of Companies)
SHAW ROAD, SPEKE, LIVERPOOL 24. **Telephone: HUNTS CROSS 2121**

PERMUTIT

FOR FIRST OIL/COAL BURNING STATION OF C.E.G.B.



The boilers at C.E.G.B. Marchwood Generating Station operate at 925 lb. per sq. inch, and are provided with "Deminrolit" treated make up feed. There is no split responsibility with a "Deminrolit" Plant because Permutit design and manufacture the Plant, also develop and manufacture their own Ion Exchange Resins. This is exclusive to Permutit.

THE PERMUTIT COMPANY LIMITED

DEPT. T.H.317, PERMUTIT HOUSE, GUNNERSBURY AVENUE, LONDON, W.4 · PHONE: CHISWICK 6431

THE PERMUTIT CO. OF AUSTRALIA PTY. LIMITED ★ **THE PERMUTIT CO. OF SOUTH AFRICA (PTY.) LTD.**

567-573, Pacific Highway, Sydney, N.S.W. P.O. Box 6937, Johannesburg

ION EXCHANGE (CANADA) LTD., 33, Price Street, Toronto 5, Ontario

FOR DISTRICT HEATING and INDUSTRIAL PLANT REQUIREMENTS

LA MONT HOT WATER BOILERS

HIGH, MEDIUM and LOW PRESSURES

Two 50 million B.T.U.s/hr. LA MONT HIGH TEMPERATURE HOT WATER BOILERS fired by extra heavy fuel oil installed for HUMBER LIMITED, STOKE, COVENTRY.

LA MONT Hot Water Boilers are the most efficient, flexible and compact units available for industrial heating and district heating requirements.

Suitable for coal, oil, creosote, pitch or gas firing and for utilising the waste heat in flue gases from all kinds of industrial processes.

LA MONT STEAM GENERATOR LIMITED

HEATHER PARK DRIVE, WEMBLEY, MIDDX.

Telephone: WEMBLEY 8821

A2

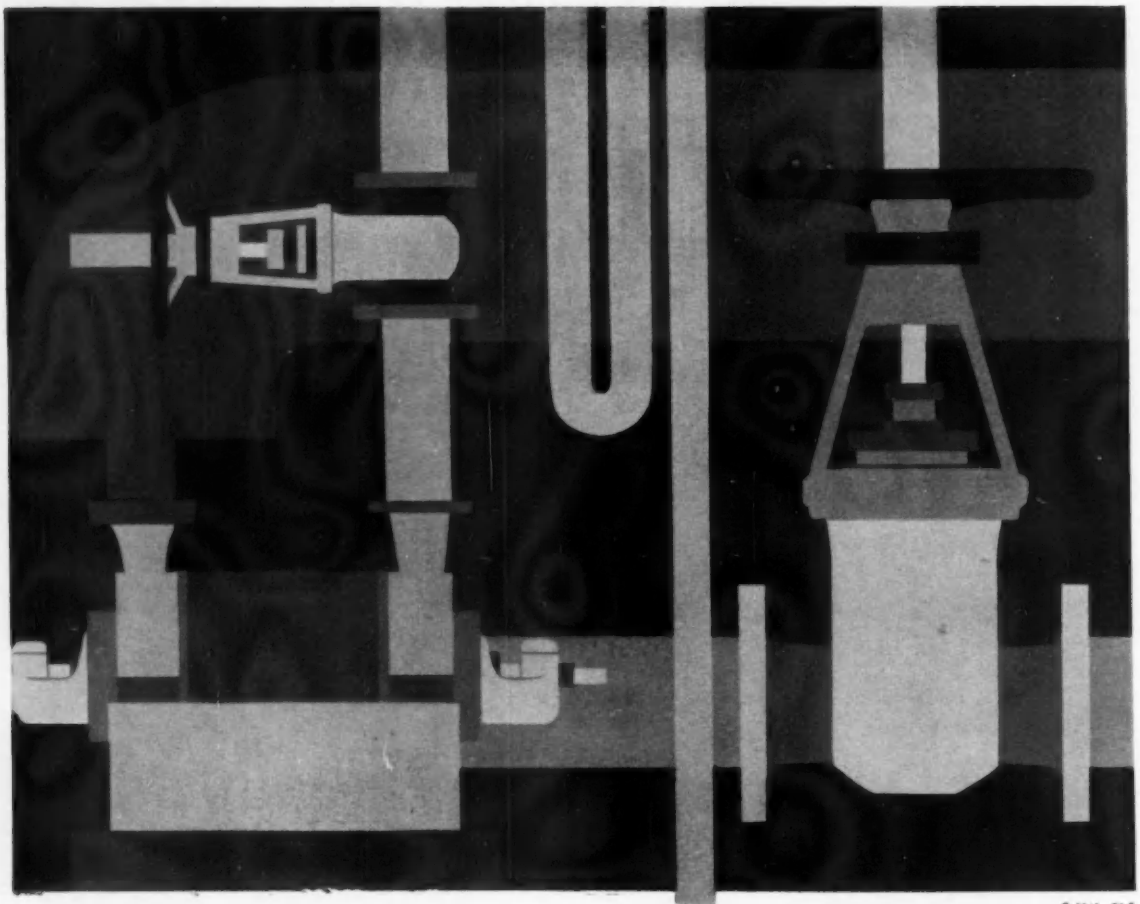
for ALL ENGINEERING SUPPLIES –

COCKS, VALVES
GAUGES, ETC.
PACKINGS, JOINTINGS
BELTINGS, VEE ROPES
OILS AND GREASES
HOSES AND FITTINGS
ETC., ETC.

HOP 8022
25 lines

LARGE STOCKS – KEEN PRICES
Write or phone

W.H. WILLCOX & CO. LTD.
SOUTHWARK STREET, LONDON, S.E.1



C 0360-72 E

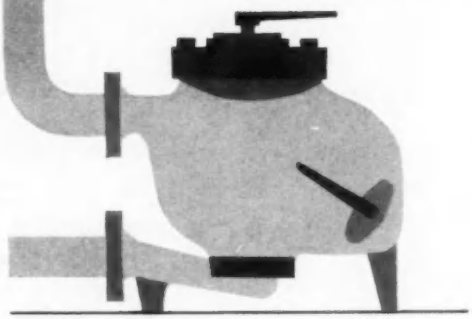
PUMPS, VALVES, STEAM TRAPS etc.

As leading makers of such equipment we have developed a close association with those concerned in the design and construction of Power Plants, and their confidence in our products is evidenced by the fact that the majority of power stations on the continent employ KSB-AMAG equipment for the wide range of pressures, temperatures and capacities that are encountered.

Our new type of Feed Pump with expansion-compensated casing is installed in the first European Power Plant operating at supercritical pressure. Our glandless circulating pumps are in service in high-pressure orthodox and Nuclear Thermal Plants, and our Valves with pressure seal bonnet for very high pressures and temperatures up to 1100 F and more are all giving faithful service.

Our Works can meet any demand for pumps or allied equipment.

KSB EXPORT GMBH, FRANKENTHAL/PFALZ

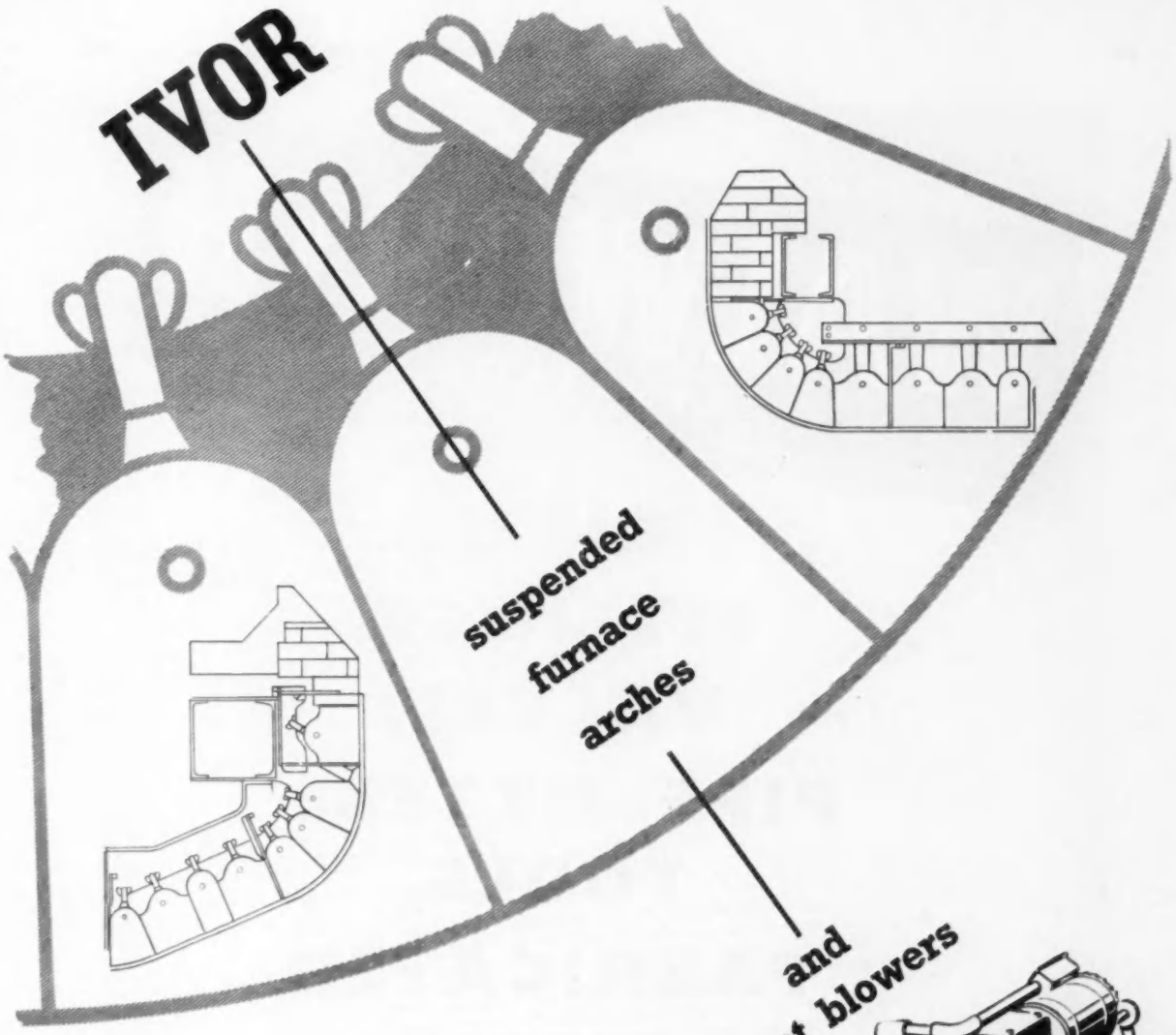


KSB

General-Agents for Great Britain:
The K.S.B. Manufacturing Co. Ltd.,
6, Broad Street Place, London, E.C.2

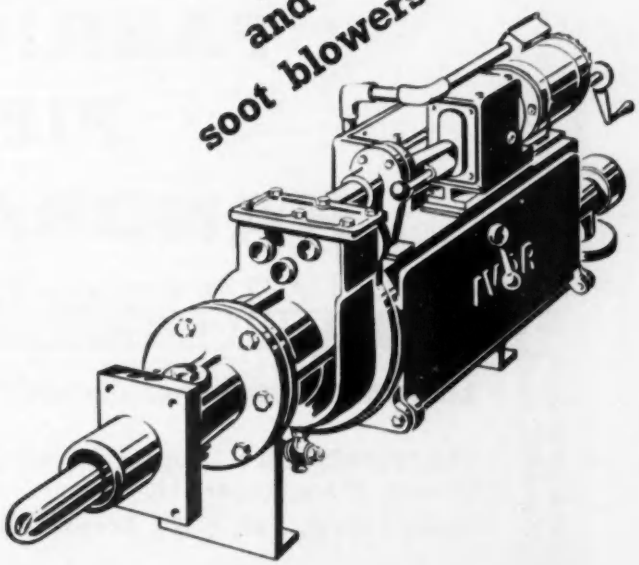
We are exhibiting at the Engineering, Marine, Welding and Nuclear Energy Exhibition from the 16th to 30th April 1959, Stand No 6, B. B., first floor, Empire Hall

IVOR



suspended
furnace
arches

and
soot blowers



Two major steps
towards maximum boiler availability.
Ivor Pendulum—suspended refractory arches
permit quick renewal of defective areas
without major dismantling ;
while Ivor Sootblowers maintain
clean heating surfaces without shutdown.
Please ask us for full information.

IVOR POWER SPECIALTY CO. LTD.

29 WOBURN PLACE, LONDON, W.C.1, AND AT ABERDARE, SOUTH WALES

Broadway/ips/1

WALWORTH
LIMITED

TUBES,
FITTINGS,
VALVES,
PIPE FITTERS'
TOOLS,
FABRICATED
PIPES,
HANDRAILS, etc.

TUBES • FITTINGS • VALVES & PIPE FITTERS'

VALVES

LONDON: 90-96 Union Street, Southwark, S.E.1. . . . . *'Phone: Waterloo 7081*

MANCHESTER: Poplar Works, Poplar Street, Viaduct Street, Manchester, 11. *'Phone: East 2458-9*

GLASGOW: 48 York Street, Glasgow, C.1. . . . . *'Phone: Central 1053-4*

TOOLS

FITTINGS • VALVES & PIPE FITTERS' TOOLS •

Rotary Water Strainers

Size "N" for 3,500,000 g.p.h.

The Hick Hargreaves self-cleaning enclosed Rotary Water Strainer is proving, in service throughout the world, to be the most effective means of removing floating debris. The strainer comprises a motor driven wheel, slowly rotating inside a casing, the straining medium which is between the spokes being so designed to prevent the interlacing of fibrous matter. The head loss through the strainer does not exceed 2 feet. The debris is removed from the strainer by a series of jets, and discharged from an internal chamber which is effectively sealed off from the main water space. All water connections are placed in the lower half of the casing and large access doors are provided for routine examination. Installation is extremely simple, no extensive foundation work being necessary. The strainer can be located on either the suction or discharge side of the circulating water pumps.

The Hick Hargreaves Rotary Strainer is available in a range of capacities up to 5,000,000 g.p.h. with mesh of $\frac{1}{16}$ in. to $\frac{1}{4}$ in. diameter inscribed circle.

Hick Hargreaves

AND COMPANY LTD · BOLTON

H.139B

"So Crane giant valves help me make my salad!"

SURPRISING, Mrs. Hepplewhite, but true. That lettuce strainer you're shaking is made from "Alkathene"—an I.C.I. material which Crane valves help to produce. I.C.I. use Crane giant valves in the early processing stages—and like many another firm find them completely trouble-free. The giant valve is just one among a whole range of Crane valves, from $\frac{1}{8}$" to 24", each with a tradition of reliable service. Whatever *you're* making, keep Crane in mind—for valves you can bank on.

Among the country's largest industries using CRANE giant valves are : *Esso Petroleum Co. Ltd · British Nylon Spinners Ltd · Imperial Chemical Industries Ltd · Firestone Tyre & Rubber Co. Ltd · Reed & Smith Ltd · 'Shell' Refining Co. Ltd · Pfizer Ltd.*

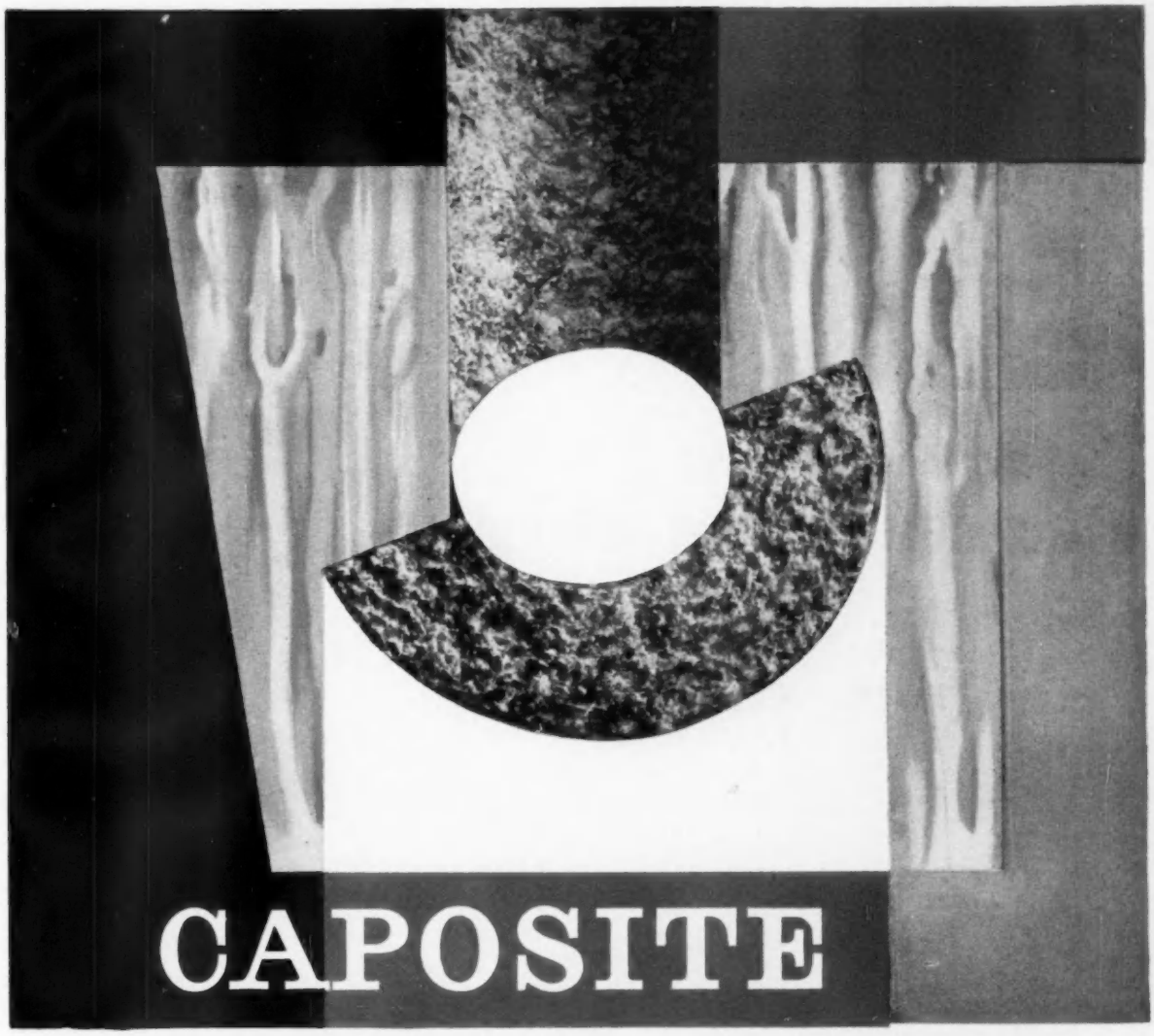
* * * *

CRANE

VALVES OF BRONZE, CAST IRON AND CAST STEEL

CRANE LTD., 15-16 RED LION COURT, FLEET STREET, LONDON, E.C.4. WORKS: IPSWICH

Branches: Birmingham, Brentford, Bristol, Glasgow, London, Manchester.

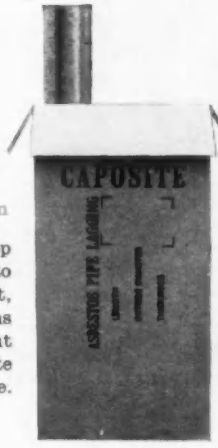


INSULATION

'efficient, economical'

Caposite insulation has high thermal efficiency due to its being made from unique long fibred amosite asbestos from the company's own mines. These long fibres give Caposite great mechanical strength, enable it to be preformed in large sizes, and to be applied as a single layer.

amosite asbestos preformed insulation



CAPOSITE is clean

clean to cut and sweep away—no mess to stick to boots. It comes in light, non returnable cartons which make handy off-cut bins—there's no waste with Caposite.

CAPE

THE CAPE ASBESTOS COMPANY LTD

114 & 116 PARK STREET, LONDON W.1. GROsvenor 6022

GLASGOW: Hobden Street, Petershill Road, Glasgow N.1. Springburn 6144
MANCHESTER: Floor D. National Buildings, St. Mary's Parsonage, Manchester 3. Deansgate 6016-7-8
BIRMINGHAM: 11 Waterloo Street, Birmingham 2. Midland 6565-6-7
NEWCASTLE: 19 & 20 Exchange Buildings, Newcastle. Newcastle 20488

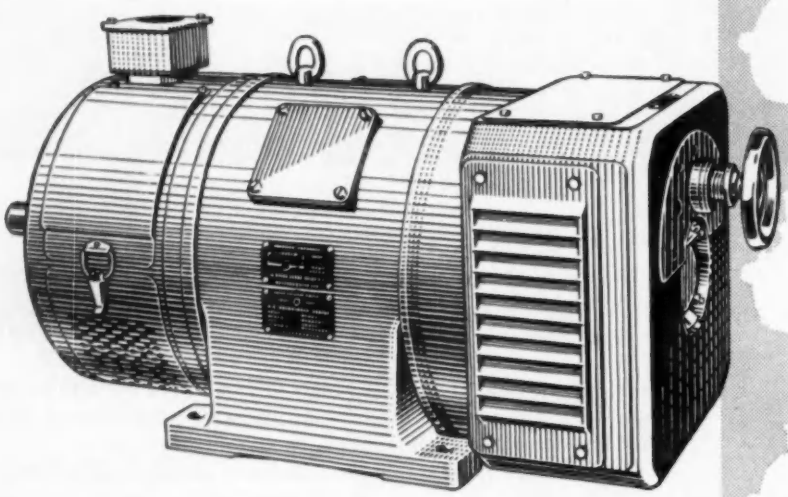
TA1631

B
T-H

small variable-speed

A.C. COMMUTATOR MOTORS

from stock



over 50 ratings

up to 20 h.p.

wide speed range

stepless speed variation

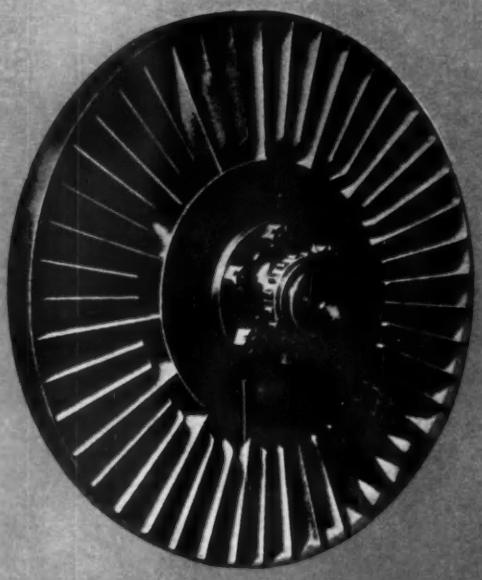
no ancillary equipment

BRITISH THOMSON-HOUSTON

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

an A.E.I. company

A 5404

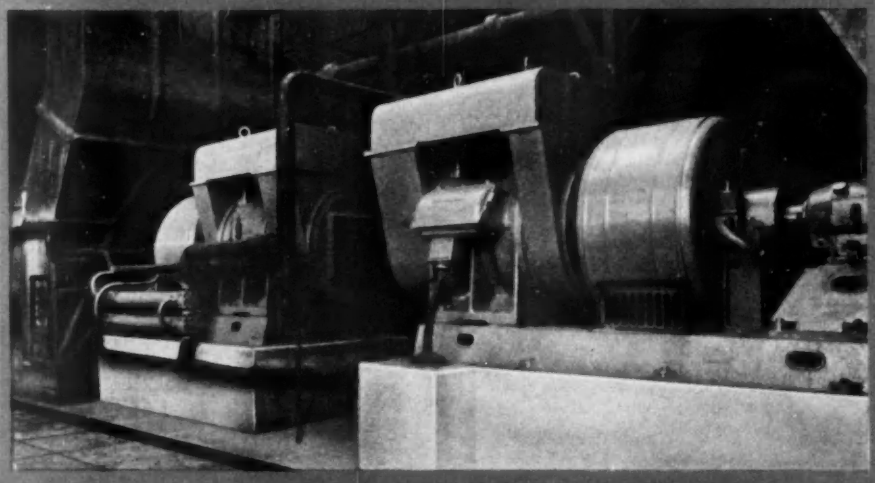


Visit the Great
ENGINEERING
MARINE
WELDING
& NUCLEAR
ENERGY
EXHIBITION
OLYMPIA LONDON
16th-30th APRIL 1959

Why Fluidrive

- Infinitely variable speed regulation
- Admirably suited to automatic control
- Efficiency combined with simplicity
- Off-load start for S.C. motor
- Maintenance reduced to absolute minimum

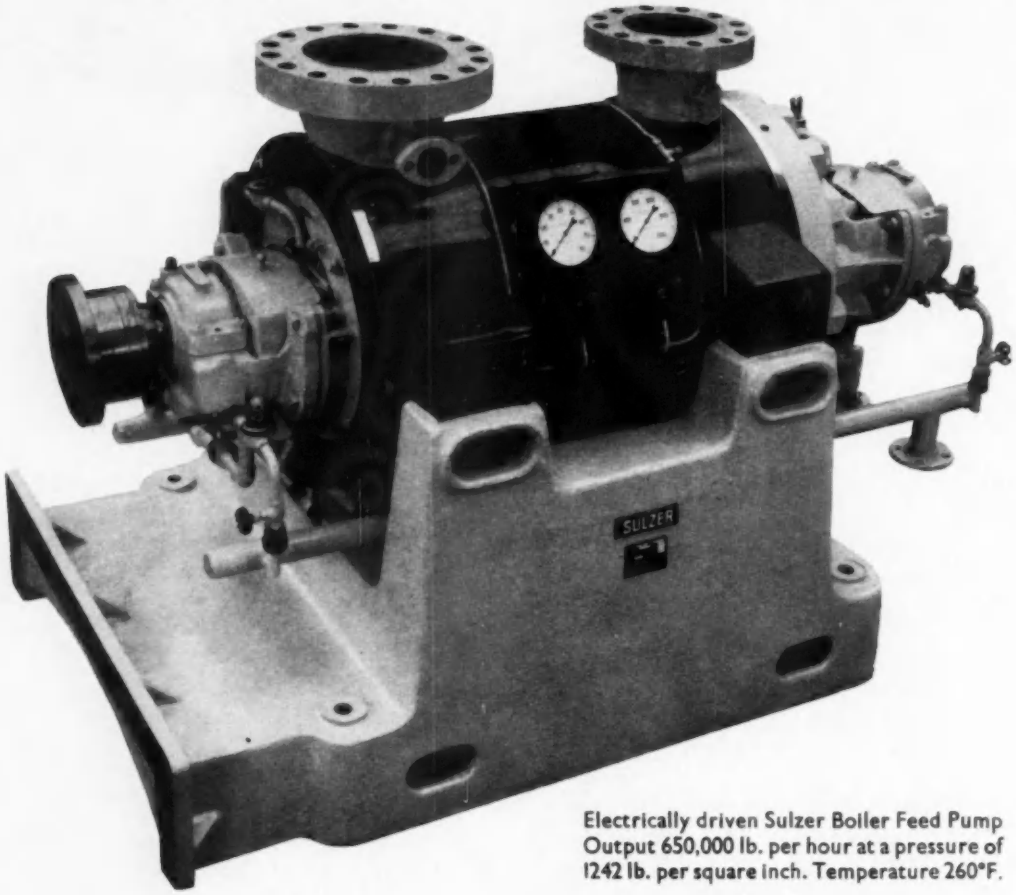
FOR
BOILER DRAFT FANS



I.D. fan drives with S.C. motors of 471 h.p. at 748 r.p.m. and size 41 Vulcan-Sinclair scoop-control fluid couplings at Staith South Power Station of the N.E. Division of the Central Electricity Generating Board.

FLUIDRIVE ENGINEERING CO. LTD.
FLUIDRIVE WORKS • WORTON ROAD • ISLEWORTH • MIDDX.

SULZER
BOILER - FEED PUMPS



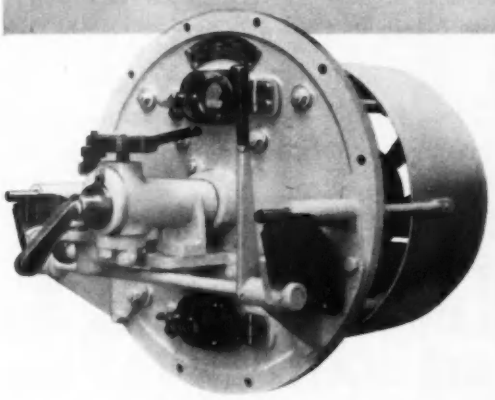
Electrically driven Sulzer Boiler Feed Pump
Output 650,000 lb. per hour at a pressure of
1242 lb. per square inch. Temperature 260°F.

one of nine units for
MARCHWOOD POWER STATION
of the
CENTRAL ELECTRICITY GENERATING BOARD

SULZER BROS. (LONDON) LTD., 31, BEDFORD SQUARE, LONDON, W.C.1
(INCORPORATING HATHORN DAVEY & COMPANY, LTD.)

SULZER BROTHERS LIMITED HAVE OFFICES AT — WINTERTHUR · PARIS · NEW YORK · MADRID · CAIRO · RIO DE JANEIRO · BUENOS AIRES · KOBE · LISBON · JOHANNESBURG · MEXICO CITY
Representative at — BRUSSELS · MILAN · AMSTERDAM · COPENHAGEN · OSLO · STOCKHOLM · HELSINKI · ATHENS · ISTANBUL · ALGIERS · HAIFA · BOMBAY · KARACHI · COLOMBO
SINGAPORE · BANGKOK · RANGOON · SAIGON · MANILA · MONTREAL · BOGOTA · CARACAS · SANTIAGO (CHILE) · LIMA · LA PAZ · SYDNEY · MELBOURNE · WELLINGTON · VIENNA

To help keep the air of Britain clean

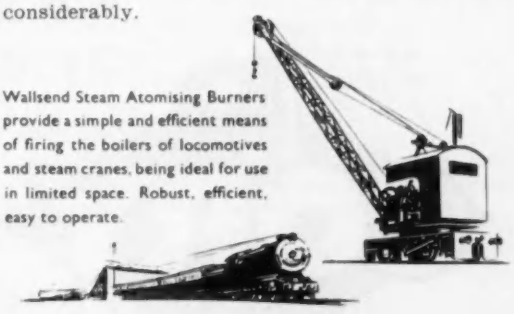


Consult the specialists in manufacture and installation of every size and type of Liquid Fuel Burner.

THE WALLSEND SLIPWAY AND ENGINEERING COMPANY LIMITED

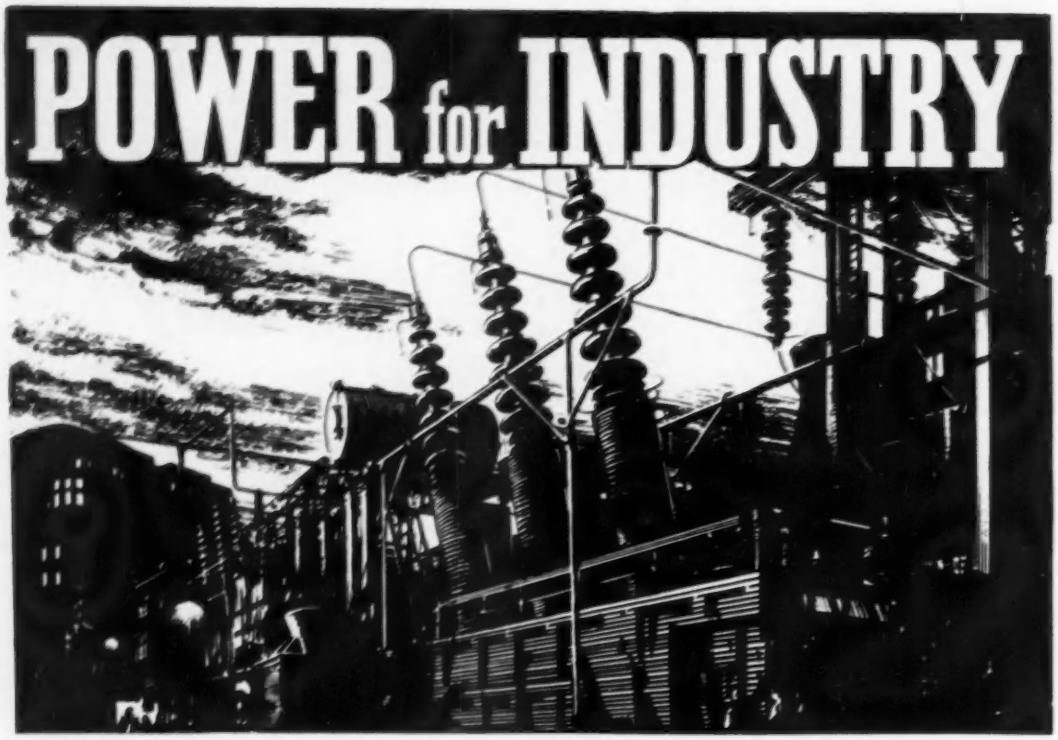
Wallsend Oil Burning Systems are making a valuable contribution to the Clean Air Act. They have already been installed successfully in many industrial plants. They eliminate heavy smoke and grit and, in addition, their excellent design and high efficiency helps to reduce running costs considerably.

Wallsend Steam Atomising Burners provide a simple and efficient means of firing the boilers of locomotives and steam cranes, being ideal for use in limited space. Robust, efficient, easy to operate.



WALLSEND-ON-TYNE, PHONE : WALLSEND 63161, GRAMS : WALL, WALLSEND

POWER for INDUSTRY



Power for factories, machinery, and transport; for heat and light, is to-day largely derived from electricity, which still has its origin in Oil and Coal.

The supply of these vital fuels is the business of Wm. Cory & Son Limited, who are distributors to Industry throughout the world, of Oil and Coal, by Road, Rail and Water.

OIL AND COAL
BY ROAD, RAIL & WATER

WM CORY & SON LTD

Our Technical Advisory Staff are available for consultation on all problems concerning the most effective use of these fuels, **and compliance with the Clean Air Act, 1956.**

CORY BUILDINGS, FENCHURCH STREET, LONDON, E.C.3. *Telephone:* ROYal 2500

combat atmospheric pollution with the NEW "ALLEN-DEP" GRIT ARRESTER

(British Pat. No. 699760)
Also covered by patents in other countries.

FACTORY EQUIPMENT EXHIBITION
EARLS COURT
APRIL 7–17, 1959
SEE OUR EXHIBIT
STAND A.4

NEW TO GREAT BRITAIN—

"DEP" Dust Control Equipment—already established throughout Europe—is now available for the FIRST TIME in Gt. Britain, manufactured at our Tipton works. The new **"ALLEN-DEP" GRIT ARRESTER** is designed to cover the widest possible field of Dust and Grit Control. It is particularly suitable for Boiler Plant.

ADVANTAGES OF "ALLEN-DEP" GRIT ARRESTER—

- **High efficiency under all conditions**
- **Back pressure negligible for all requirements**
- **Simplicity and ruggedness**
- **Economical to instal, with low running and maintenance costs**
- **Power saving, compared with other similar equipment**
- **No modification needed generally to fan or stack**
- **Has the capacity to deal with high or low-dust conditions**
- **Is able to cope with large or micronic dust particles**
- **Can withstand high temperatures**
- **Is suitable for varying flow conditions**
- **Can be used as a dry, wet or viscous filter**

LET OUR ENGINEERS GIVE YOU—

Advice and Erection Service—The Benefit of wide application—Practical guidance during installation—Final installation inspection and running tests—Periodic routine visits for maintaining efficiency.

For further information, write to—

ALLENS of TIPTON

W. G. ALLEN & SONS (TIPTON) LTD.,

P.O BOX 4 · TIPTON · STAFFS.
Tel: TIPton 1266

AIR MOVEMENT BY NATURAL FORCES COSTS NOTHING

and the next cheapest is ....

by the use of " Gyra-Flo " Airfoil Centrifugal Fans with their aero-dynamically designed backward curved blades.

"Gyra-Flo" Airfoil Fans effect a 25% reduction in operating costs.

Our Engineers will advise, or write and ask for leaflet No. KF100

GYRA-FLO TRADE MARK
AIRFOIL CENTRIFUGAL FANS

The MIDLAND HEATING & VENTILATION CO. LTD.
BIRMINGHAM II

BIRMINGHAM: VICtoria 3781 STOCKPORT: WOOdley 3611 GLASGOW: BIShopbriggs 2667

MAKERS OF MIDAC *DUST & FUME CONTROL UNITS &* AQUAMISER *COOLING TOWERS*

STEAM COSTS

are often an UNKNOWN FACTOR

Our investigation may result in a considerable economy

TURBINE

PATENT

FURNACES

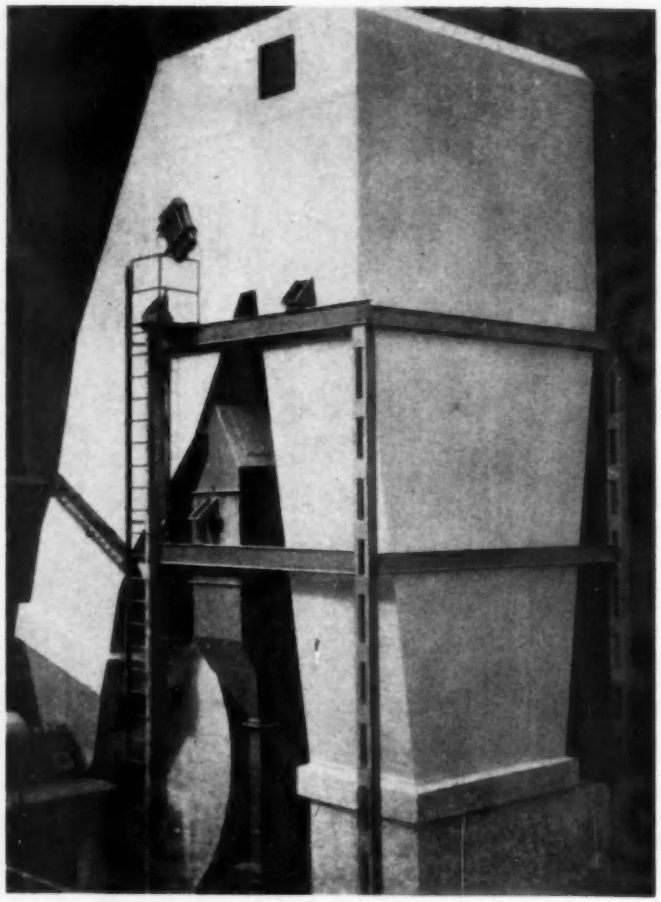
INSTALLED UNDER GUARANTEE ENSURE EFFICIENT AND **SMOKELESS** COMBUSTION

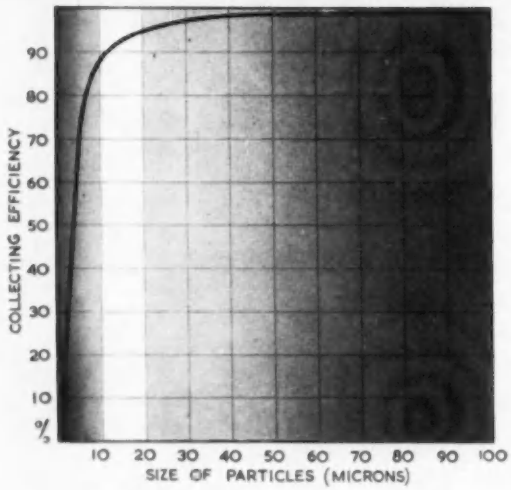
THE TURBINE FURNACE COMPANY LIMITED
238b, GRAYS INN ROAD, LONDON, W.C.1

B

Holmes-Rothemuhle Multi-Cell Cyclone Dust Collector

A Holmes-Rothemuhle Collector installation cleaning flue gases from boilers used for space heating purposes. Capacity: 100,000 c. f. m.





Fractional collecting efficiency and separation.

Designed to reduce stack emissions from hand, stoker and pulverised fuel-fired boilers. The Holmes-Rothemuhle Collector is an inexpensive and efficient solution to many of the problems involved in the collection of dust and grit particles in the higher size ranges. An indication of the collecting efficiency which can be expected for various particle sizes is given in the curve on the left which is plotted for a dust density of 2 grams per c.c.

In addition to the advantages of low installation, operating and maintenance costs the Holmes-Rothemuhle Collector has the added advantage of space-saving construction which enables the collector to be easily fitted into existing flue-gas ducting

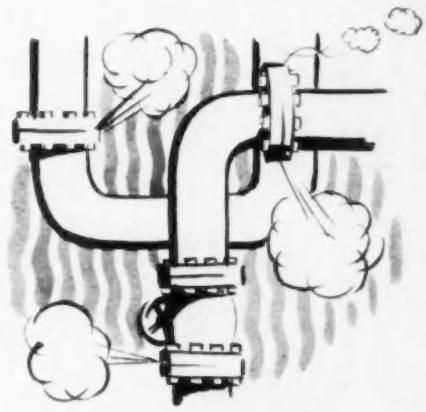
W. C. HOLMES & CO. LTD.

Gas Cleaning Division,
TURNBRIDGE, HUDDERSFIELD

Telephones : Huddersfield 5280 Birmingham : Midland 6830 London : Victoria 9971

© A.22

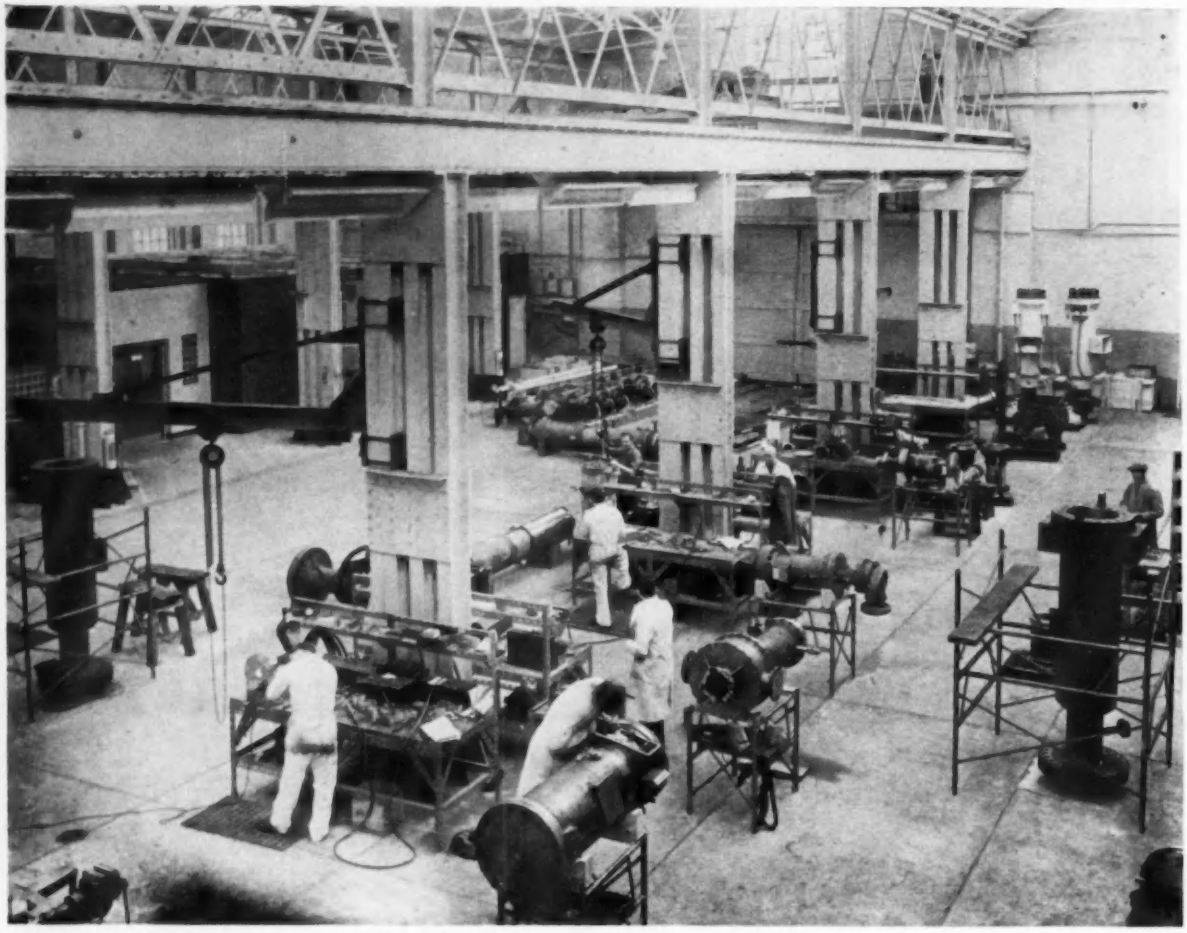
There are lots
of ways of
wasting fuel—
but one good way
of saving it
is to instal a



GREEN'S ECONOMISER

E. GREEN & SON LIMITED · WAKEFIELD

Makers of economisers for more than one hundred years



This is where the pumps are made . . .

. . . the pumps for high and low pressure circulation in the heat exchangers at Calder Hall and Chapelcross; the circulating pumps for every British Nuclear Power Station so far built or under construction, the heavy water pumps for Harwell, Dounreay, Hifar, Riso, and Julich; the 250 HP 2650 PSI pumps for the CEGB Base Load Station at High Marnham; the 350 HP 3000 PSI pumps for Toronto; the 400 HP 2580 PSI pumps for Vaires-sur-Marne; the 500 HP 2575 PSI pumps for Thorpe Marsh; the 500 HP 2650 PSI pumps for Blyth B. . . .

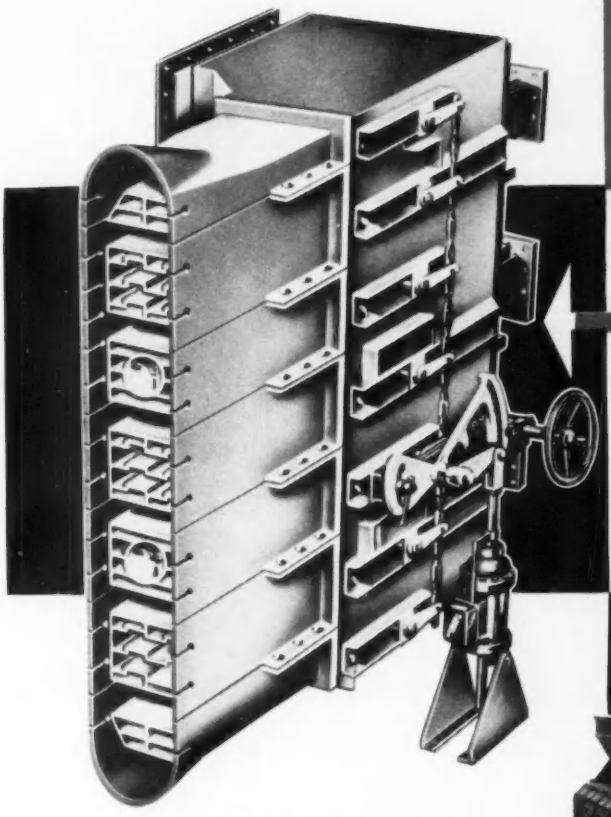
All the above are zero-leakage glandless motor pump units. The Hayward Tyler factories at Luton and East Kilbride also produce Submersible Borehole and Mine De-watering Pumps; Fire Pumps; Chemical Pumps; Oil Refinery Pumps; Oil Pipeline Pumps; Oil Cargo Pumps and Steam Turbines.

HAYWARD TYLER

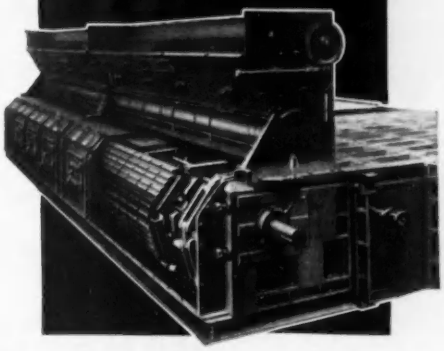
& CO. LTD., LUTON TELEPHONE: 6820

LONDON OFFICE: SALISBURY HOUSE, FINSBURY CIRCUS, E.C.2. NATional 9306

STEAM RAISING
FOR
INDUSTRY



Burner
or
Stoker?



As combustion engineers with considerable experience, IC are able to recommend and supply the most suitable firing equipment for coal, oil or gas to ensure the best possible use of your fuel.

IC

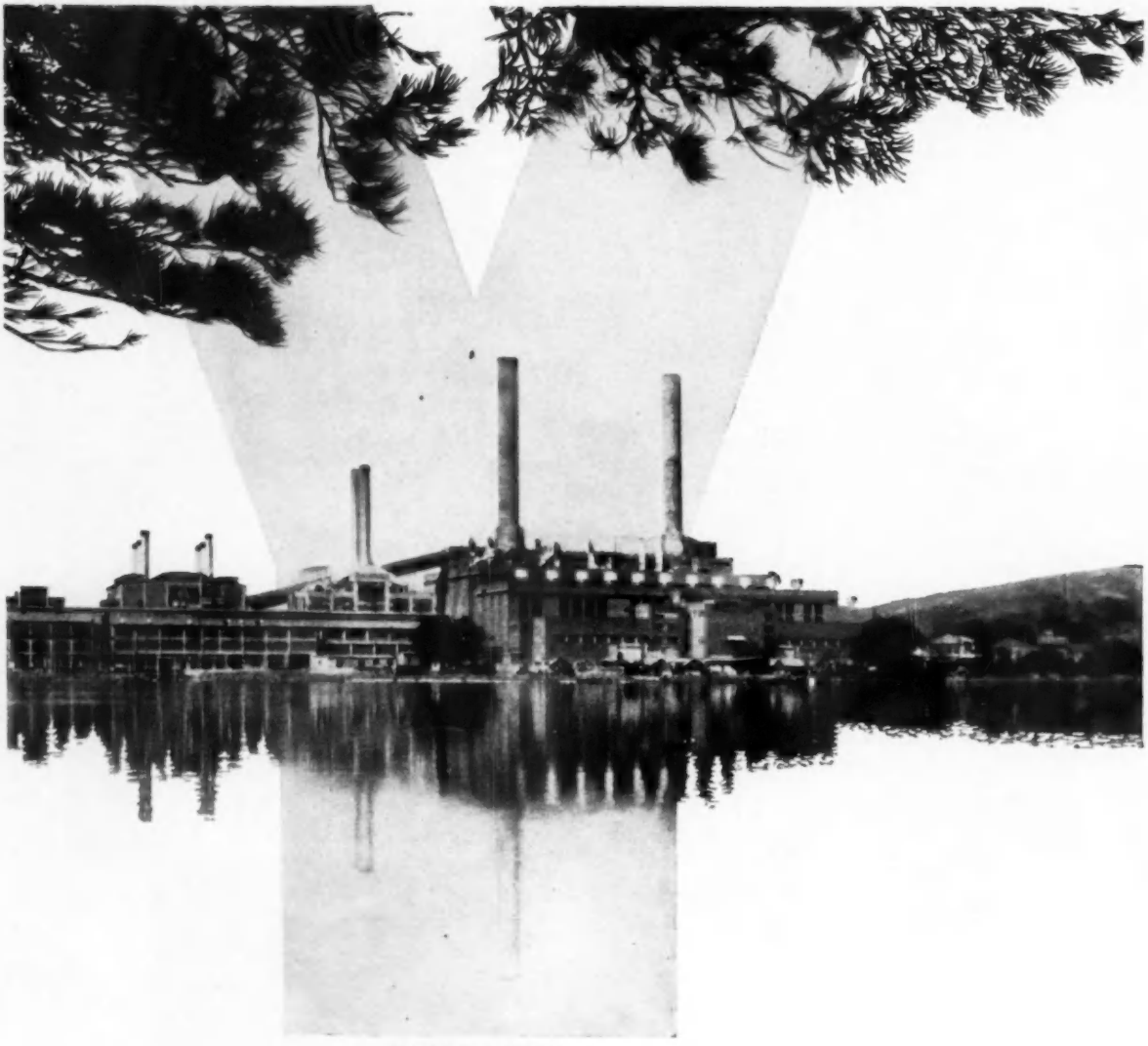
See us at the Engineering, Marine, Welding and Nuclear Energy Exhibition, stands No. 10, row C and No. 12, row A, ground floor, Grand Hall, Olympia.

INTERNATIONAL COMBUSTION PRODUCTS LTD.

NINETEEN WOBURN PLACE, LONDON, WC1. WORKS: DERBY

Member of Atomic Power Constructions Limited. One of the Five British Nuclear Energy Groups

TGA 1812



1934-1959
18 YARROW BOILERS
installed at Pretoria 'A & B'
Power Stations

NOW

2-550,000 lb per hour
950 lb per sq. inch

915°F pulverised fuel fired
YARROW boilers ordered by
Pretoria City Council for
the new power station at

ROOIWAL

YARROW AND CO. LTD. SCOTSTOUN · GLASGOW · W.4

YARROW AFRICA (PTY) LTD · PO BOX 619 · JOHANNESBURG · SOUTH AFRICA

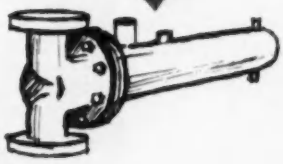
Just missing something in the way of heat recovery from steam plant rarely makes sense.

It might make sense if heat recovery were an extravagant, complicated kind of thing, but for the most part it isn't.

An obvious source of " waste " heat is hot condensate. The immediate thing is to see whether this condensate can be returned to the boiler feed tank, thus cutting down fuel bills.

Sometimes this condensate gets back to the feed tank at too high a temperature and it is then worth examining whether part of its heat can be recovered through a flash vessel as flash steam.

This flash steam is every bit as good as steam at the same pressure generated by a boiler, and is an equally adaptable tool. It can, for example, provide hot water for heat or process through the use of a steam-to-water calorifier.



Indeed, a careful but simple arrangement of a suitable Spirax flash vessel and ' H ' Type heat exchanger is almost a classic example of commonsense, economical heat recovery.

The Spirax ' H ' Type design provides a high rate of efficient heat transfer, offers compactness in both size and price, allows easy specification, installation and maintenance, avoids expansion troubles, and offers a choice of horizontal or vertical fitting. Though not only a heat recovery unit, it does make many heat recovery theories click in practice.

We've a number of free publications on heat recovery. Are you sure you have them all?

SPIRAX - SARCO

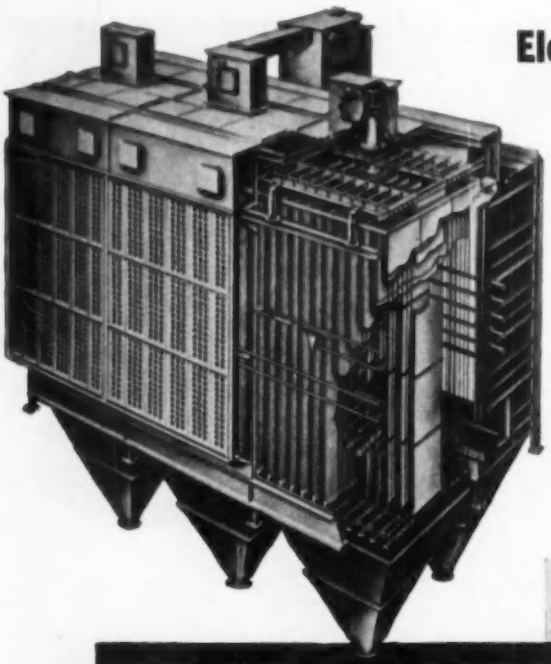
Please send.....copies of " Flash Steam Recovery."
.....copies of " Condensate Return."
.....copies of Pamphlet 401 describing the Spirax " H " Type Heat Exchanger.

NAME

ADDRESS

EB459

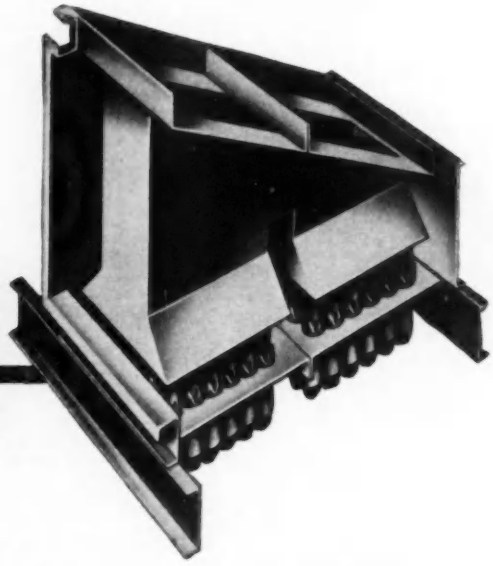
Spirax-Sarco Ltd. Cheltenham, Glos. Phone: Cheltenham 5175-76 London: 28 Victoria Street, SW1 Abbey 6101-3832



Electrostatic Precipitators

Made under licence from the Aerotec Corpn., U.S.A., these precipitators have an extremely high collection efficiency, low current consumption and many novel design features including screen-grid type collecting electrodes which minimise re-entrainment and consequent emission of dust. Manufactured in several combinations of width, height and length to suit available space in existing plants or most efficient usage of building volume in new constructions.

PD–KB



Multitubular Dust Collectors

Here is a dust collector which satisfies the ideal requirements of steam generator designers. It has a high collection efficiency at moderate resistance; maximum freedom from dust erosion; accessibility for maintenance and service; simple, low cost erection; flexibility of arrangement to meet space availability conditions. These collectors can be used in series with electrostatic precipitators and can be designed to match the precipitator inlet.

Induced & Forced Draught and Grit Arresting Fans

The product of over 75 years of experience, 'Tornado' induced and forced draught fans can handle any boiler draught requirements efficiently and reliably. The type A.R. aerofoil section backward bladed centrifugal fan, with peak efficiency of 90%, is only one of the many types (another is the combined induced draught and grit arrester) produced to deal with all classes of boilers from central heating to those in the largest power stations.

for CLEAN AIR

KEITH BLACKMAN LTD
(Incorporating Blackman Export Co Ltd)
MILL MEAD ROAD · LONDON N.17
in collaboration with Prat-Daniels (Stroud) Ltd., Whitecroft, Nailsworth, Gloucester

TA.971

Save on fuel and upkeep

Wet-back. Fully-Auto. With fully modulating oil burner.

Here's the boiler that works hard *quietly*, and takes little time off. It's Clyde-built . . . tough, and as neat as a ship of the line. Self-contained . . . fully automatic . . . boilerman's delight. Press the button and it goes to work . . . 82 per cent. efficiency easily . . . on and on and on. Don't stop to replace refractory linings, it has none: it has a new design of *wet-back* combustion chamber which eliminates brickwork.

Price ? You'll be very agreeably surprised.

Time ? Put *Multipac* straight in. It needs only a small floor-space. It's delivered complete, steam-tested. Just connect up to it and put it to work . . . hard work . . . clean work . . . money-saving work.

Ask for descriptive literature. Or better, telephone or write to say you are coming to see a *Multipac* at work. They're wonderful boilers.

JOHN THOMPSON (WILSON BOILERS) LTD. LILYBANK WORKS, LONDON RD, GLASGOW E.1

G1/9

EXPANSION

VIBRATION

MOVEMENT

Can we help you with your pipe problems?

SEE US AT
STAND 13
Outer Row Gallery
National Hall
ENGINEERING
EXHIBITION
April 16th to 30th
OLYMPIA

Expansion, contraction and lateral movement of pipe work under extreme conditions of temperature and pressure is no problem to the engineer who has been wise enough to contact and consult TEDDINGTON technicians.

Teddington Bellows Expansion Joint cylinders are butt-welded from highly finished cold rolled stainless steel sheet. Convolutions are introduced to give the bellows their characteristic flexibility. Nuclear, chemical, marine and gas engineers acknowledge their efficiency and superiority over many older forms of expansion joint. Wherever pipework is subjected to vibration or movement in any direction, a Teddington Bellows with a suitable end-fitting will solve the problem.

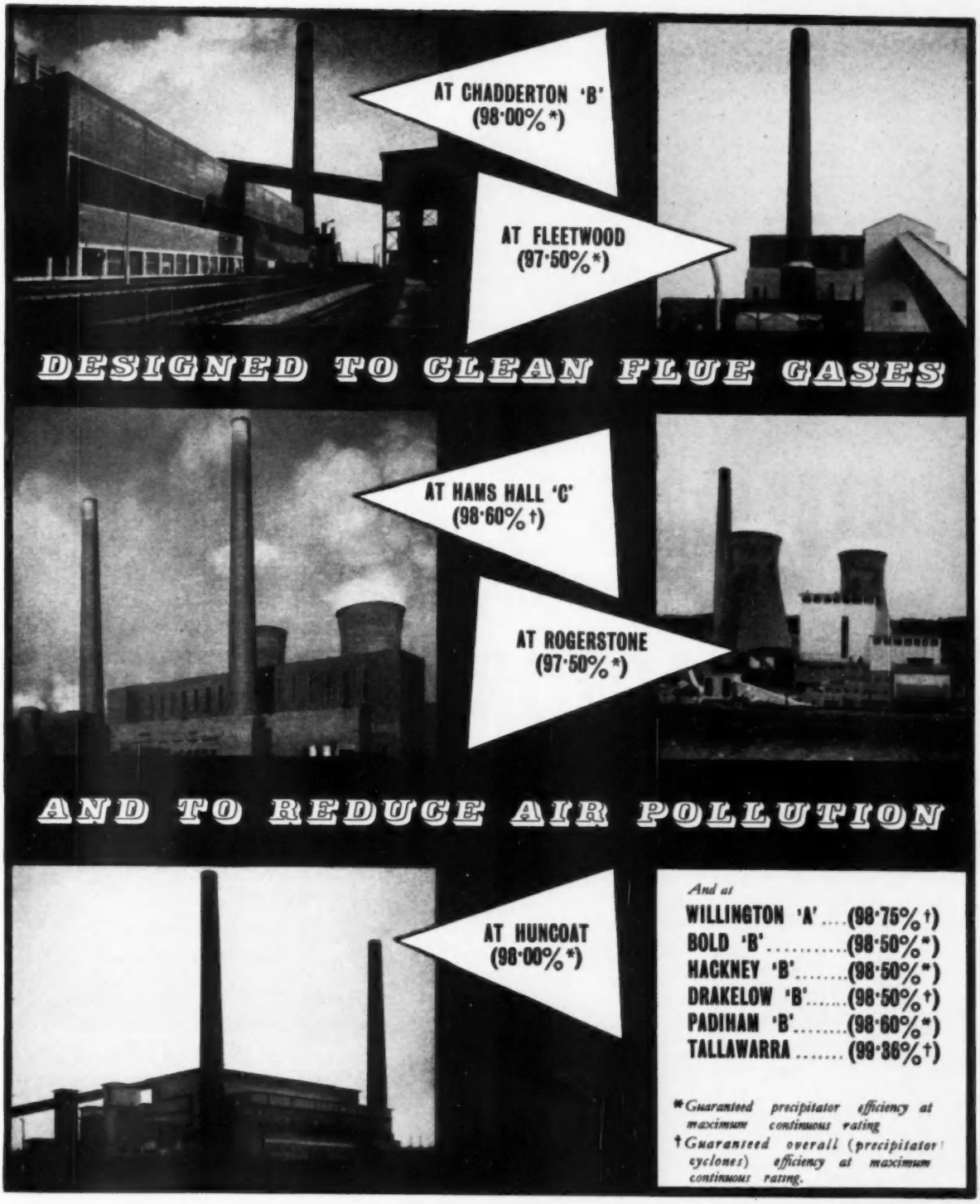
SEND FOR BROCHURE No. E47

Teddington Bellows are produced in technical collaboration with the Solar Aircraft Co., U.S.A.

TEDDINGTON BELLOWS

EXPANSION JOINTS

TEDDINGTON AIRCRAFT CONTROLS LTD. · · · INDUSTRIAL BELLOWS DIVISION
Ammanford, Carmarthenshire · Tel. : Ammanford 2255



High efficiency electro-precipitation

by ***Simon-Carves Ltd***

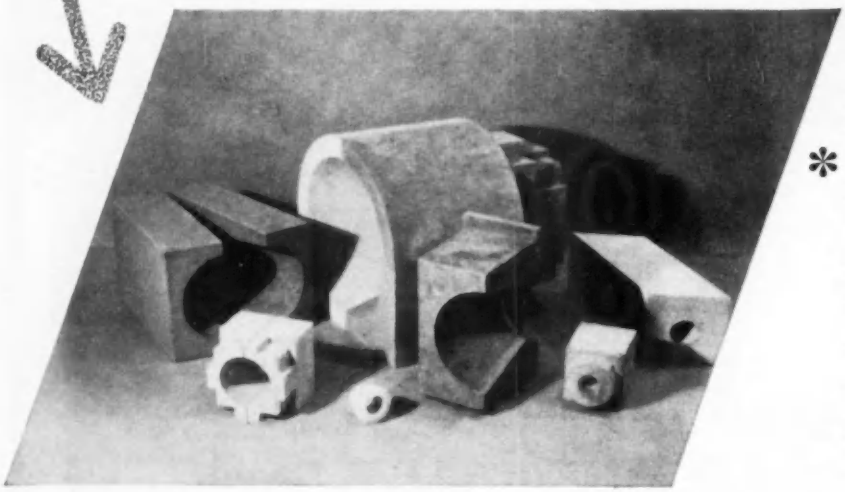
STOCKPORT ENGLAND

OVERSEAS COMPANIES | *Simon-Carves (Africa) (Pty) Ltd : Johannesburg. Simon-Carves (Australia) Pty Ltd : Botany, N.S.W.*

SC192/PS

CAST YOUR OWN BURNER BLOCKS * WITH REFRACTORY CONCRETE

EXTREME ACCURACY BY SIMPLE CASTING



SAVE MONEY and eliminate delays in delivery of special shapes

*

Crushed firebrick or special aggregates bonded with CIMENT FONDU Aluminous Cement or SECAR 250 White Calcium-Aluminate Cement depending on conditions.

CIMENT FONDU Regd. Trade Mark ALUMINOUS CEMENT — up to 1350°C — WITH SUITABLE REFRACTORY AGGREGATES — up to 1800°C — SECAR 250 REGD. TRADE MARK

WRITE FOR BOOKLETS 'SECAR 250' AND 'REFRACTORY CONCRETE'

LAFARGE ALUMINOUS CEMENT CO. LTD. 73 BROOK STREET, LONDON, W.1 Telephone: MAYfair 8546

AP/77

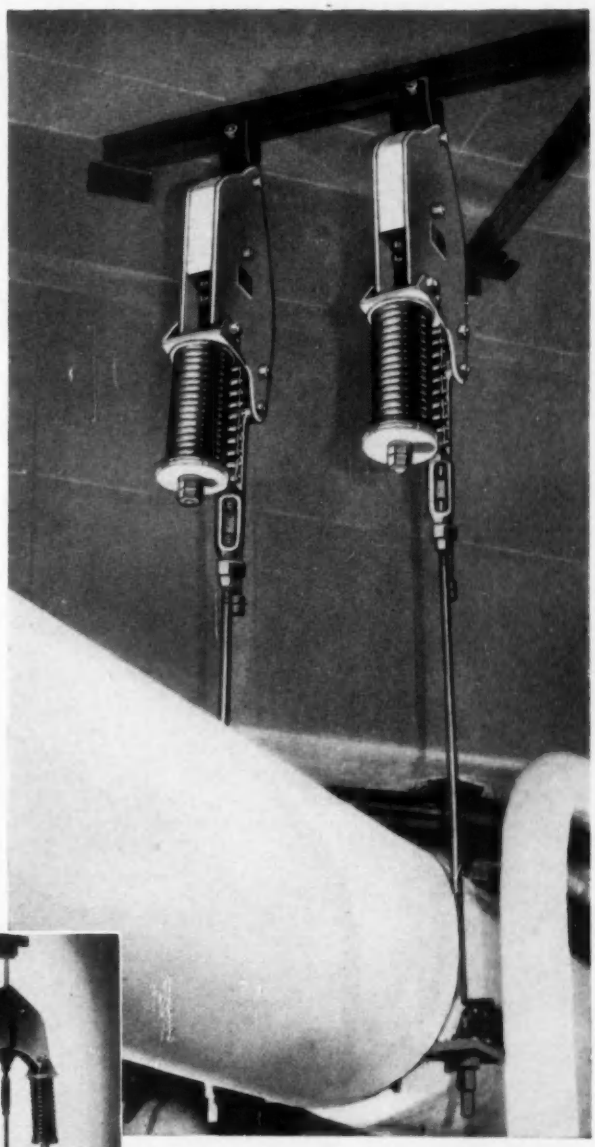
CON-TEN

constant tension supports

FOR LOADS UP TO 8 TONS
PIPE MOVEMENTS UP TO 18"

High-pressure steam piping is subject to wide variations in temperature, which produce considerable expansion and contraction. Unless the pipe supports can absorb and compensate for this movement, severe stresses are set up which may result in fracture. The " Con-Ten " Pipe Support is designed to cradle any type of piping with constant tension under all conditions, throughout the range of movement. " Con-Ten " is installed, with eminently satisfactory results, in power stations, and oil refineries, chemical and industrial plants throughout the world.

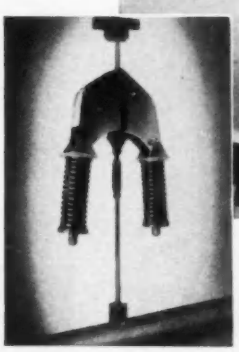
British Patent Nos. 474008 720074 720075 697987 657318
U.S.A. Patent No. 2129320



Ferrybridge "B" Power Station. Central Electricity Generating Board, Yorkshire Division. H.P. Steam pipes supplied and installed by Stewarts & Lloyds Ltd.

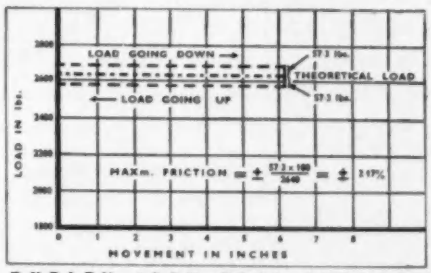
Leibfried Red Top Pipe Supports for loads from 100 to 5,000 lbs. and total travel of 3".

Conventional type " Con-Ten " Supports for loads up to 2 tons with a total vertical movement up to 12".



Duplex " Con-Ten " Supports for load of up to 8 tons with a total vertical movement up to 12". This type is acknowledged as one which produces minimum friction and kinematic variation. It has been specially designed for any applications where exceptional accuracy is demanded.

From graph it can be seen that the maximum friction is equivalent to 2.17% of the applied load.



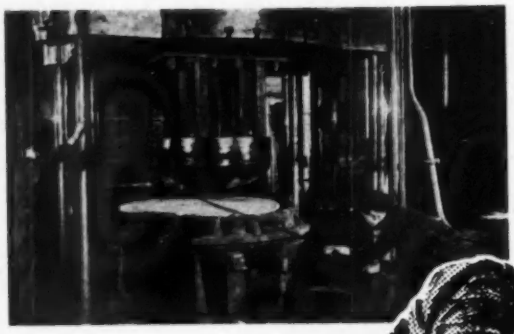
DUPLEX 'CON-TEN' SUPPORT

BRITISH INDUSTRIAL

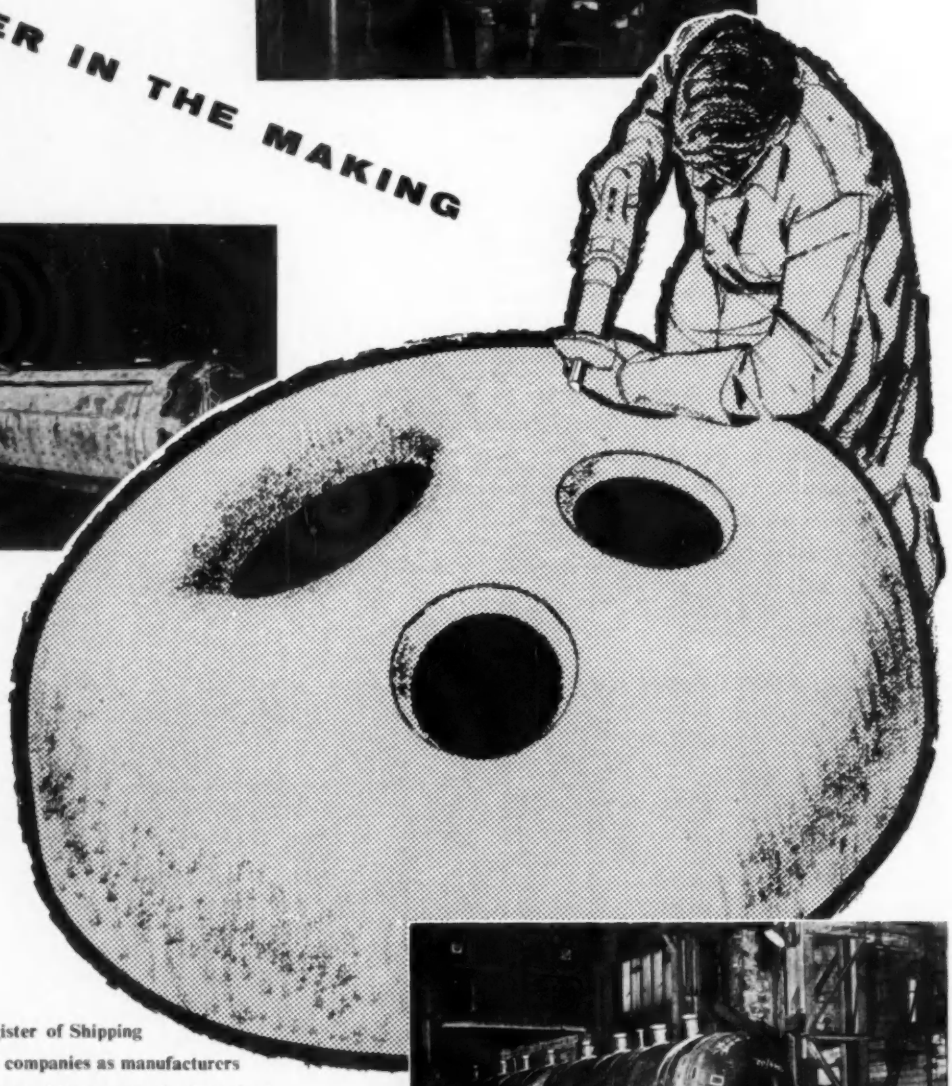
ENGINEERING COMPANY (STAFFS) LIMITED

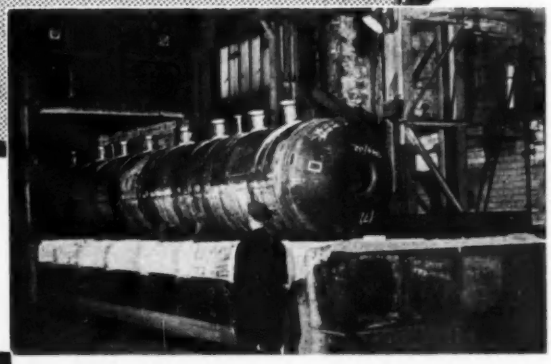
CORONATION WORKS, HAINGE ROAD, TIVIDALE, TIPTON, STAFFS.

TEL.: TIPTON 1222/3/4



POWER IN THE MAKING





Accepted by Lloyd's Register of Shipping
and all leading insurance companies as manufacturers
of fusion welded pressure vessels to any standard required.

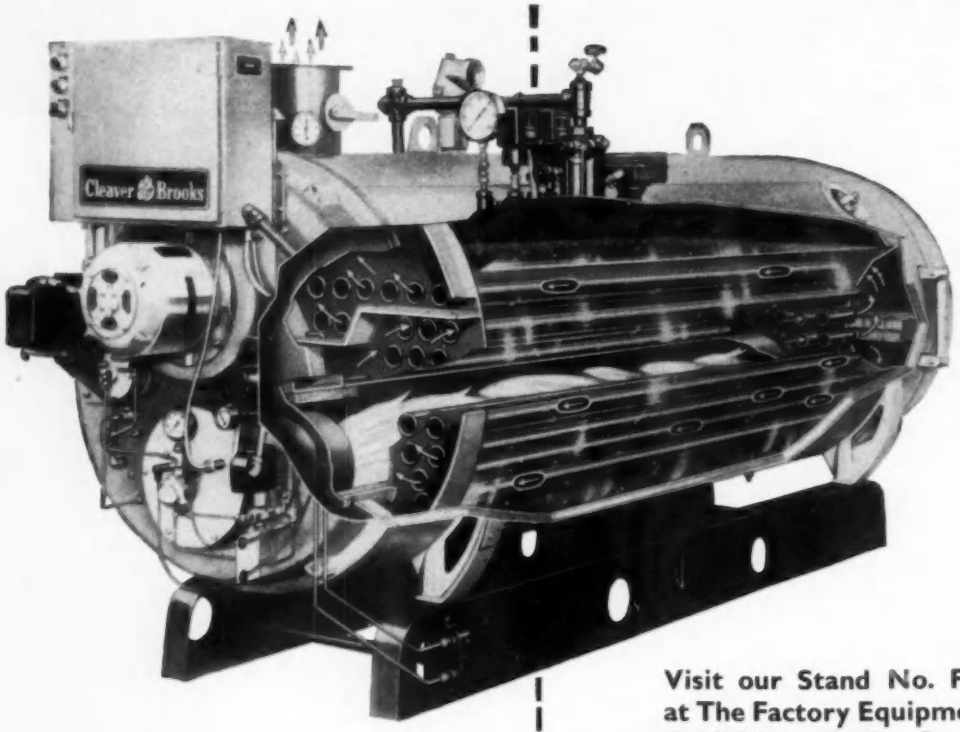
CLARKE, CHAPMAN & CO. LTD.
Victoria Works · Gateshead, 8 · Co. Durham

LONDON Dunster House, Mark Lane, London E.C.3.
GLASGOW 116 Hope Street, Glasgow C.2.
MANCHESTER 8 King Street, Manchester, 2.

Clarke Chapman

STEAM GENERATING PLANT FOR INDUSTRY

Get these
out of
your system!
These are some of the slime-forming organisms which cause loss of efficiency and blockages in industrial cooling water systems by fouling heat-transfer surfaces, filters, pipes, storage basins and cooling towers. Organic growths can be controlled by chlorination, a simple method which increases efficiency and reduces to a minimum the interruption of plant operation.
For advice on the application and handling of liquid chlorine and hypochlorites, consult:
IMPERIAL CHEMICAL INDUSTRIES LTD.,
LONDON, S.W.1
ICI
CH. 71



Visit our Stand No. F.32 at The Factory Equipment Exhibition, Earls Court, April 7th—17th.

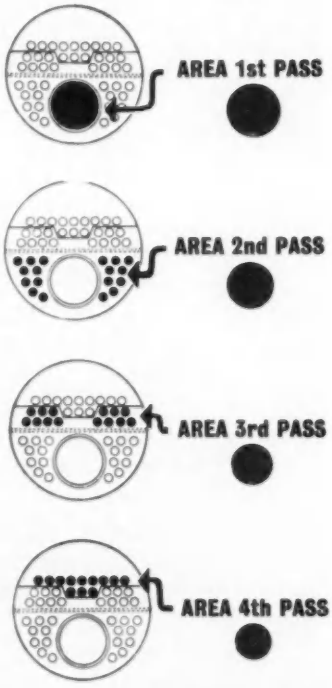
MARSHALL BUILT....

. . which means 100 years of Quality *Boiler Making*

The World's most advanced Packaged Boilers

Four Pass, forced draught construction

Cleaver-Brooks four pass design with its cross sectional area decreasing in each pass maintains that constant high gas velocity which gives maximum heat transfer. The gases literally scrub tube surfaces, improving the gas/film co-efficient and make every square foot of heating surface contribute to the unusually high overall efficiency of these Boilers.



Over 80% efficiency throughout entire operating range

Cleaver-Brooks Packaged Boilers – by Marshalls of Gainsborough

Thermal Engineering Division, Marshall Sons & Co. Ltd.,
3, Britannia Works, Gainsborough, Lincs. Phone: Gainsborough 2301

HOWDEN
ELECTRO PRECIPITATORS

clean the gases from

LARGE BOILER PLANTS

CEMENT AND CHEMICAL WORKS

METALLURGICAL FURNACES

and similar installations

PRECIPITATORS CAN BE SUPPLIED TO HANDLE GASES
COVERING A WIDE RANGE
OF TEMPERATURES AND VELOCITIES

HOWDEN

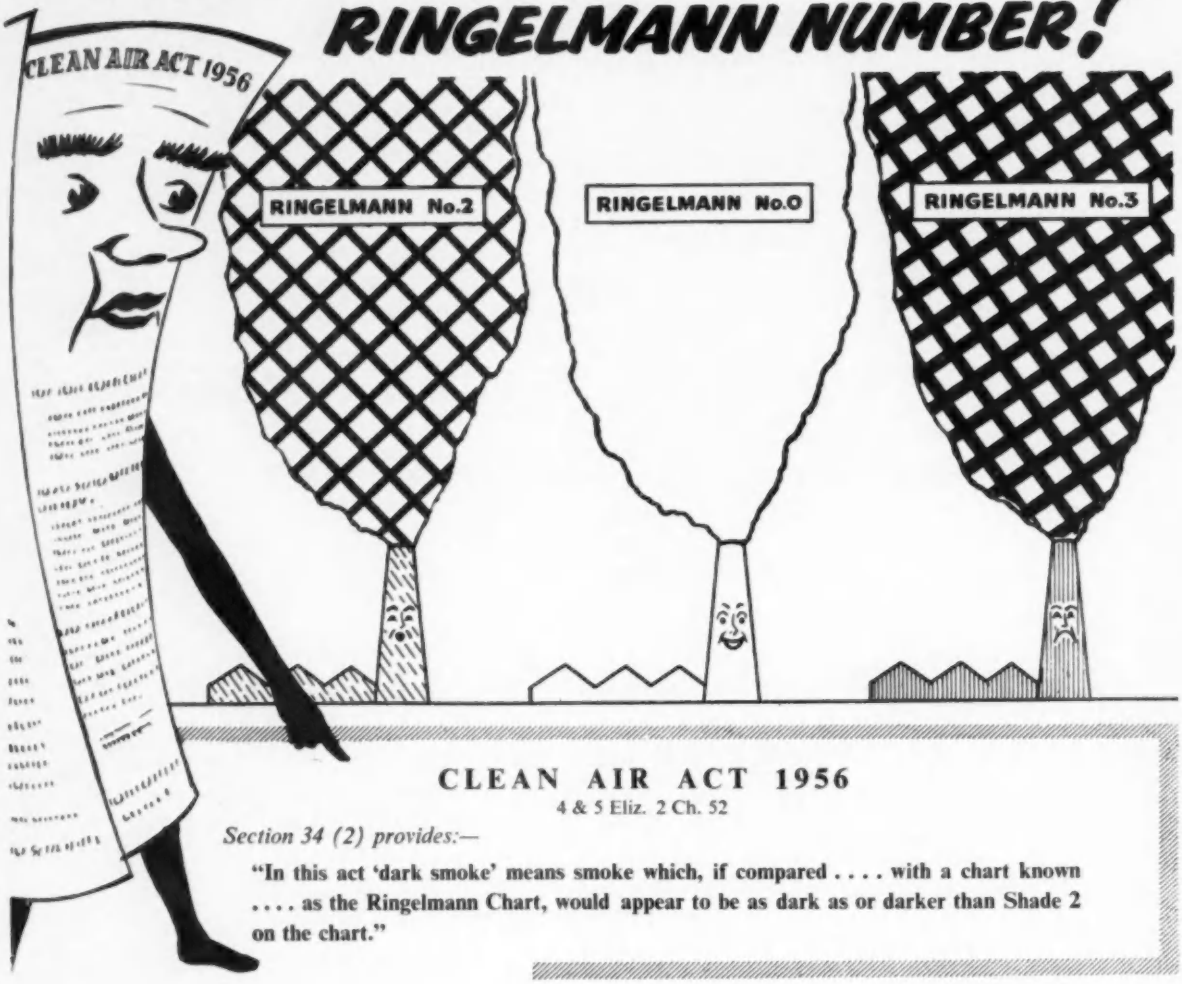
Specialists in the design and manufacture of equipment

FOR CLEANING AIR AND GASES

JAMES HOWDEN & COMPANY LIMITED

195 SCOTLAND STREET, GLASGOW, C.5
and 15 GROSVENOR PLACE, LONDON, S.W.1

What is YOUR RINGELMANN NUMBER?



CLEAN AIR ACT 1956

4 & 5 Eliz. 2 Ch. 52

Section 34 (2) provides:—

"In this act 'dark smoke' means smoke which, if compared .... with a chart known .... as the Ringelmann Chart, would appear to be as dark as or darker than Shade 2 on the chart."

No. 3 RINGELMANN
IS A FLAGRANT OFFENCE UNDER THE ACT

No. 2 RINGELMANN
FAILS TO COMPLY WITH THE ACT

No. 0 RINGELMANN
IS ASSURED WITH THE

OLDBURY
CHAIN GRATE STOKER

which anticipated the Clean Air Act by 14 years

Today more than 5,000 Oldbury Stokers are serving industry, burning solid fuels in the widest variety, **EFFICIENTLY, SMOKELESSLY.** **Leave nothing to doubt. To comply with the Act, consult Edwin Danks at Oldbury or the nearest Branch Office.**

EDWIN DANKS & CO. (OLDBURY) LTD.
OLDBURY near BIRMINGHAM · Tel: (Stoker Division) Brierley Hill 7731
LONDON · CARDIFF · GLASGOW · LEEDS · MANCHESTER · NEWCASTLE-ON-TYNE

STEIN *Refractories*

Pallet packing for ease and economy of handling with minimum damage. Please ask for details of this service.

BRITAIN'S MOST POPULAR FIREBRICK FOR OVER HALF A CENTURY.....

For over half a century Thistle quality firebrick has been recognised as one of the most dependable qualities available in this country and has remained a firm favourite with users in all heat-using industries for furnace applications calling for a 35/37% Alumina firebrick.

Please ask for copy of Pamphlet No. 1 describing our complete range of firebrick qualities.

JOHN G. STEIN & CO. LTD. Bonnybridge, Scotland

TEL: BANKNOCK 255 (6 LINES)

take NEWTHERM on test!

Test its STRENGTH

NEWTHERM is unusually strong and rigid—a feature of special importance in the larger, more vulnerable sections. Put a sample section or slab on part of your plant and *prove for yourself* its outstanding ability to withstand impact and water damage. See how it withstands rough handling in transit and erection, minimising breakage in shipment and erection by unskilled labour at the most remote sites.

Test its MOISTURE RESISTANCE

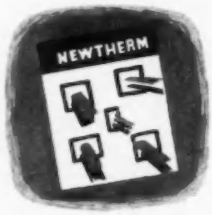
Even totally immersed in water, NEWTHERM retains much of its strength and rigidity. It does not become deformed when in contact with water, thus work-in-progress need not be covered. Especially on contracts where weather conditions would delay the application of insulation—NEWTHERM is the material to use.

Test its LIGHTNESS

Unusually light for such a high-efficiency material, NEWTHERM compares favourably in this respect with other insulants far inferior in strength. That means easier handling and fewer breakages—even the largest section is easily carried in one hand.

Test its EASE OF APPLICATION

Undoubtedly, NEWTHERM is one of the easiest of materials to apply. It is supplied in plastic form and in a wide range of standard-sized sections and slabs, smoothly finished and straight edged for immediate fitting. The finished job is very neat, with minimum joints, and appliers particularly appreciate the handleability of the material – especially in difficult situations.



READ ALL ABOUT NEWTHERM

in a specially prepared booklet. Sizes, compressive strength, thermal conductivity,—this and much more useful information can be on file if you write for your copy now, to the sole manufacturers Newalls Insulation Co. Ltd.

NEWALLS (Reg'd Brand)

***NEWTHERM** calcium silicate insulation*

. . . for temperatures up to 1400°F.

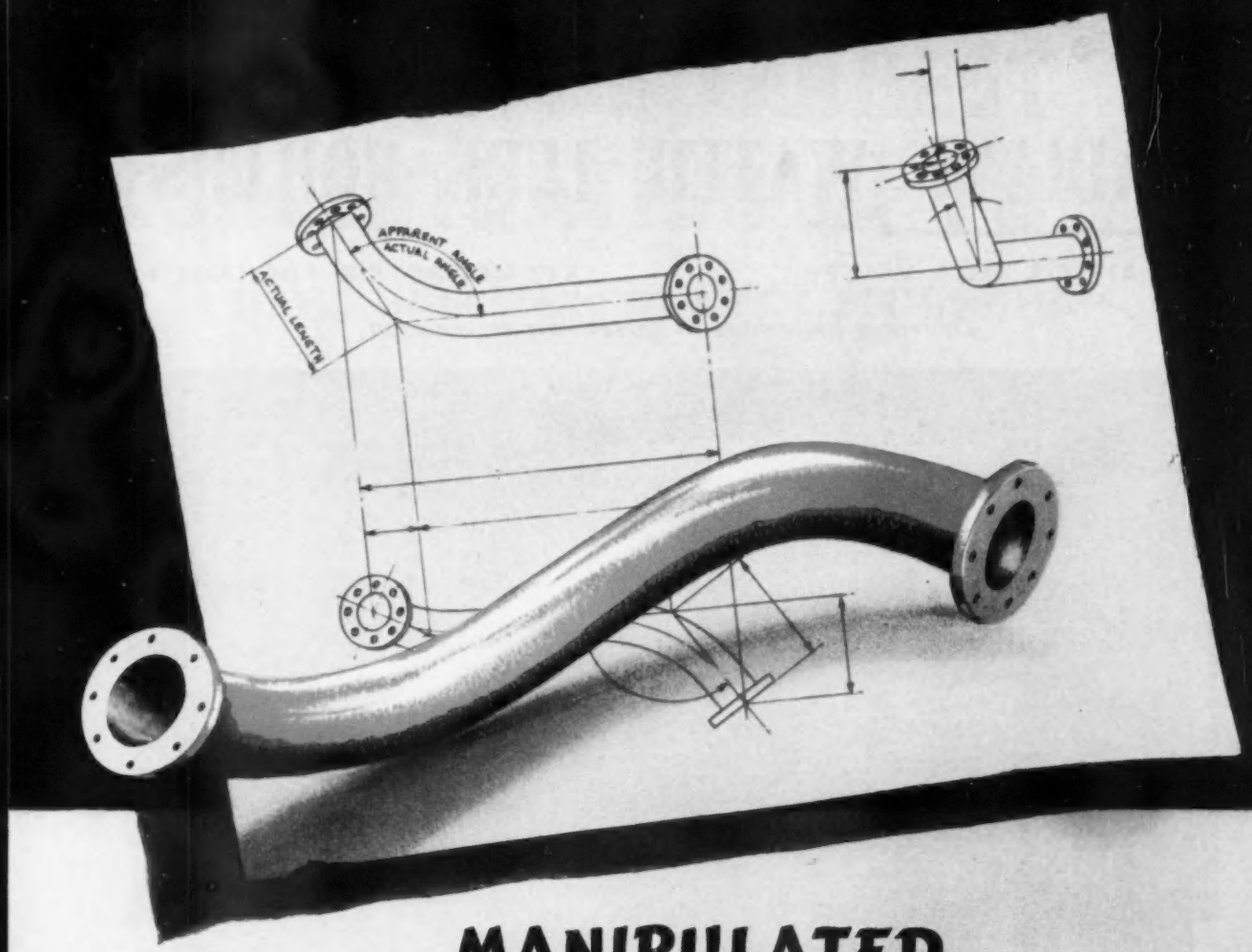
NEWALLS INSULATION CO. LTD.

Head Office: WASHINGTON, CO. DURHAM, ENGLAND.

A member of the TURNER & NEWALL ORGANISATION

Offices & Depots at: LONDON, GLASGOW, MANCHESTER, NEWCASTLE UPON TYNE, BIRMINGHAM, BELFAST, DUBLIN, BRISTOL & CARDIFF.

Agents and Vendors in most markets abroad.



MANIPULATED PIPEWORK

Many of the orders which we receive are for large pipework installations, but many more are for only a few pipes.

Our production facilities are planned to meet all requirements and whether the order is large or small, our expert design staff is always available to help you.

There are S & L Branches in most large towns.

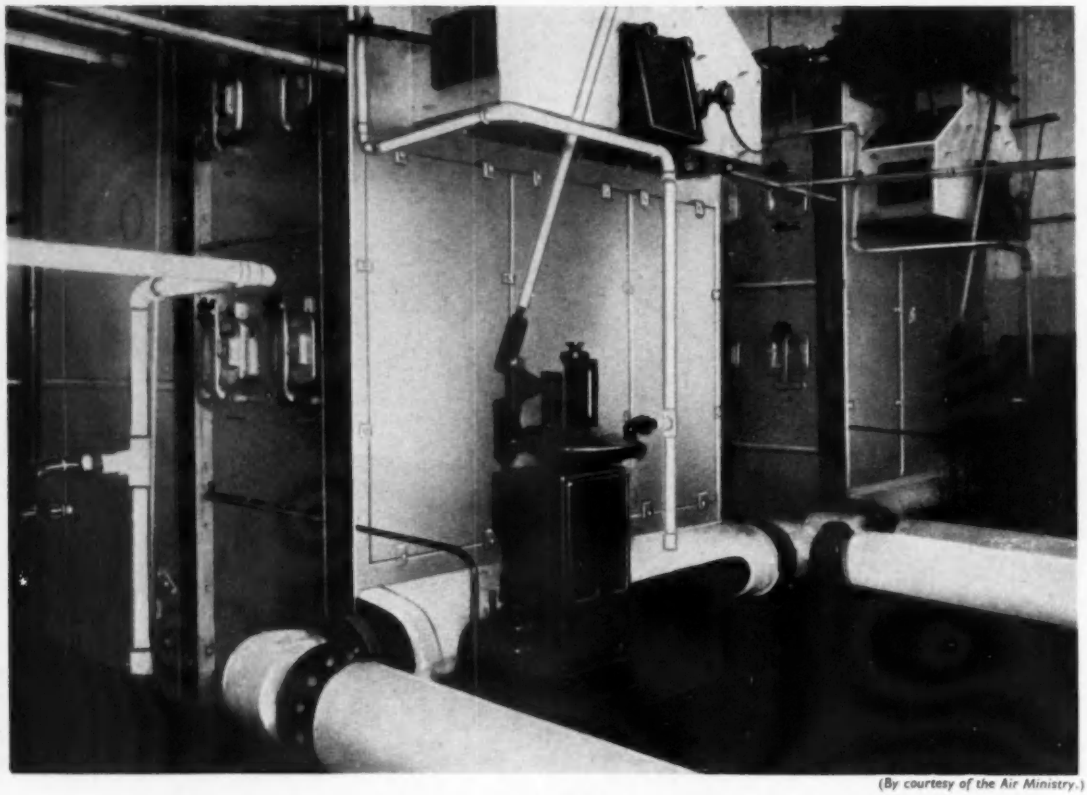
STEWARTS AND LLOYDS LIMITED

GLASGOW · BIRMINGHAM · LONDON

RADIANT WATER TUBE BOILERS

STEAM OR HOT WATER **STANDARD OR PACKAGED**

Delivered assembled or in sections as required



(By courtesy of the Air Ministry.)

Half rear view of two 7-million B.Th.U's/hr. BSF type H.P.H.W. packaged boilers.

**Please write for further particulars*

BOUËLLAT ENGINEERING LIMITED

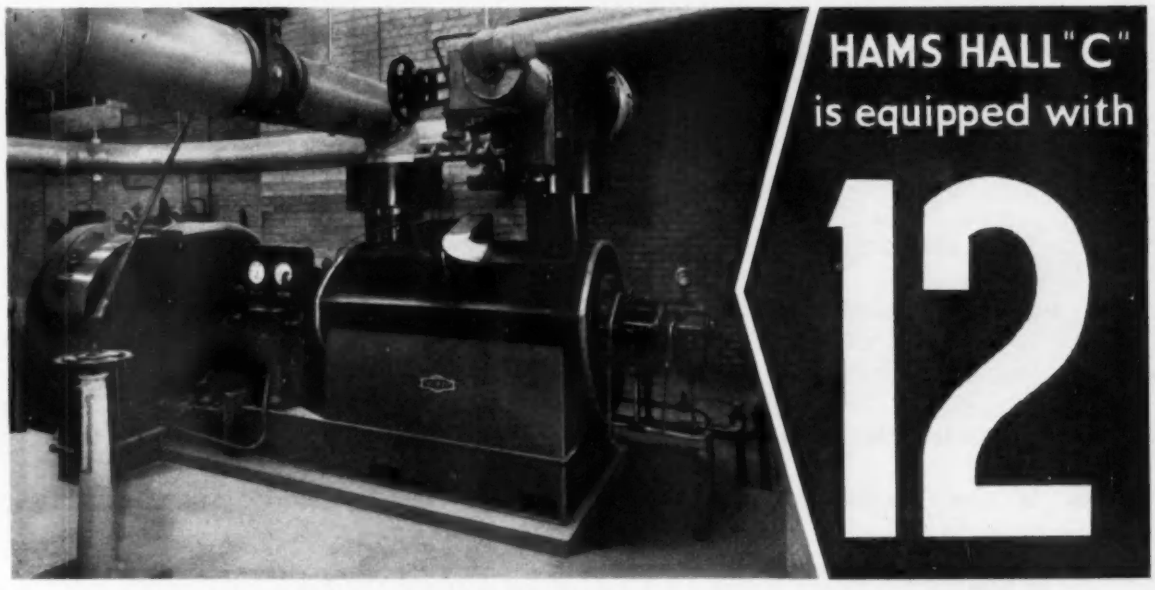
BONDWAY HOUSE, BONDWAY, LONDON, S.W.8

Telephone: VICTORIA 9851 *Telegrams: BOUELLAT, LONDON-SW8*

MANCHESTER OFFICE: 205, LONDON ROAD, HAZEL GROVE, CHESHIRE. Telephone: STEPPING HILL 2475.
AUSTRALIA: HUDSON & WEST PTY. LTD., 213-219, BROADWAY, SYDNEY, NEW SOUTH WALES.

EUROPE'S LARGEST CONCENTRATION OF POWER

HAMS HALL "A" "B" & "C" BIRMINGHAM



One of the Weir Electrofeeders in Hams Hall "C" Power Station

Weir BOILER FEED PUMPS

Each of the twelve Weir Electrofeeders in the Central Electricity Generating Board's " C " station at Hams Hall, has a capacity of 650,000 lb./hr. at 1,210 lb./sq. in. with a suction temperature of 277°F.

Weir Turbine-Driven pumps are also in use in the " A " and " B " stations at Hams Hall.

We invite you to visit us on
STAND NO. 3, ROW F, GRAND HALL,
Engineering, Marine, Welding and Nuclear Energy Exhibition
OLYMPIA . . . . 16th-30th, APRIL

Weir **G. & J. WEIR LTD · CATHCART · GLASGOW S.4**

WHITE CALCIUM-ALUMINATE CEMENT

(Over 70% Al_2O_3)

IRON COMPOUNDS & SILICA LESS THAN 1%

SECAR

250

Registered Trade Mark

This cement when mixed with appropriate aggregates provides Super-duty Castable Refractory Concrete for service temperatures up to 1,800°C (3,300°F) Refractory Concrete free from Iron Compounds & Silica is now possible for the first time.

A REFRACTORY CONCRETE FOR ANY PURPOSE

SECAR 250

is a product of

Lafarge Aluminous Cement Co. Ltd.

Manufacturers of

CIMENT FONDU

Regd Trade Mark

ALUMINOUS CEMENT

BECAUSE

Almost the entire Refractory field can be covered by Refractory Concretes based on SECAR 250 or CIMENT FONDU.

SECAR 250 concretes have all the well known properties of Refractory Concretes made with Ciment Fondu.

- **HIGH COLD STRENGTH**
- **HIGH SPALLING RESISTANCE**
- **HIGH CASTING ACCURACY**
- **NO SPECIAL PRE-FIRING PROCEDURE**

PLUS

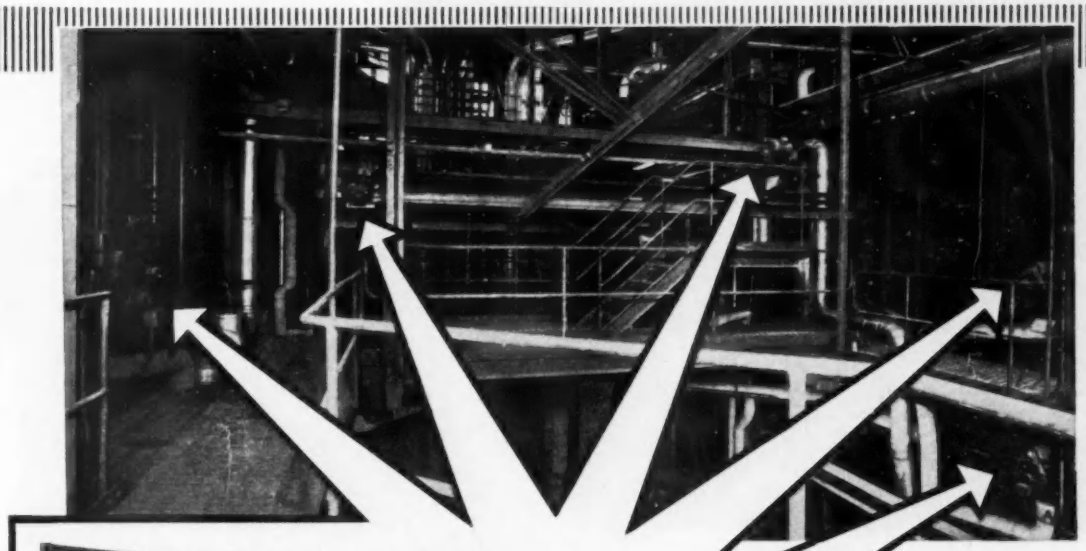
- **HIGHER PURITY**
- **HIGHER REFRACTORINESS**
- **HIGHER SLAG RESISTANCE**
- **HIGHER RESISTANCE TO REDUCING ATMOSPHERES**

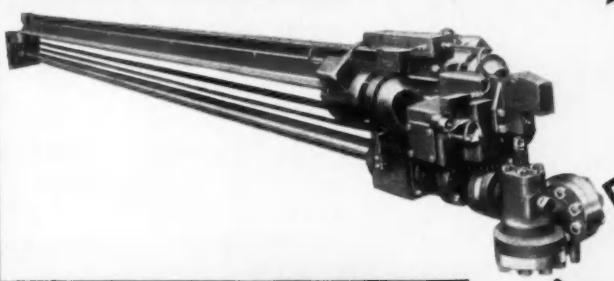
WRITE FOR BOOKLETS 'SECAR 250' AND 'REFRACTORY' CONCRETE

LAFARGE ALUMINOUS CEMENT CO. LTD. 73, BROOK STREET, LONDON, W.1. TEL.: MAYfair 8546

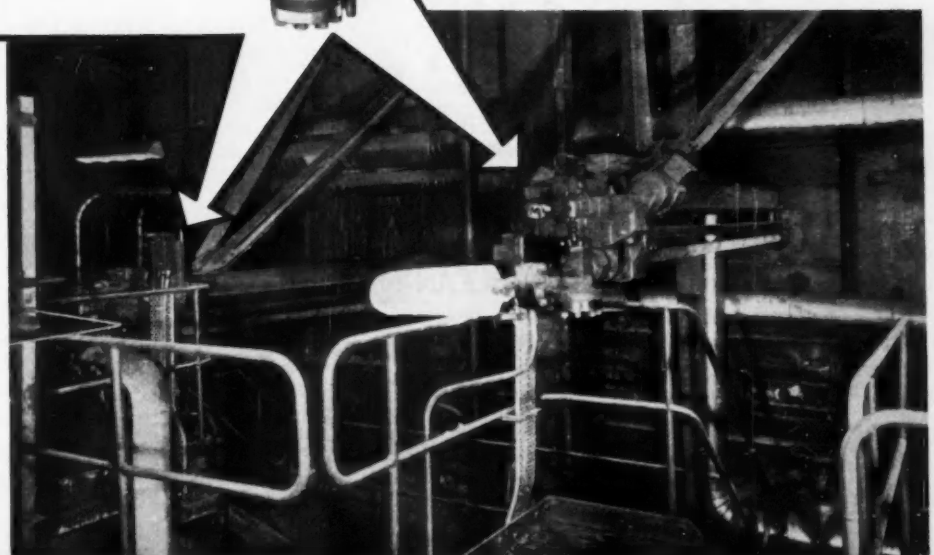
AP/48

Over 700 Boilers at home and overseas fitted with Hopkinsons' Soot Blowers





Complete range of soot blowing equipment available to cover the requirements of water-tube and "Economic" boilers, including automatic sequence control by remote electrical operation.
Write for folder 5803.



HOPKINSONS LIMITED · HUDDERSFIELD

LONDON OFFICE 34 NORFOLK STREET STRAND W.C.2

SB 4

D

HOT DUST REMOVAL

by— B.V.C
"BRITISH VACUUM CLEANER"

MODEL T.87

DUAL-PURPOSE VACUUM CLEANING PLANT

- Fitted with water-cooled primary container.
- Easy to manœuvre.
- Equally suitable for use with a pipe line.
- Special tools for special requirements.

Also **GENERAL SURFACE CLEANING**

THE BRITISH VACUUM CLEANER and ENGINEERING CO. LTD. (Dept. 67), *GOBLIN WORKS LEATHERHEAD, SURREY.* *Telephone: Ashtead 866*

D2

Damaging Slag and Carbon build-up is no longer a problem

DOHMseal, applied to existing refractory linings by brush or to new linings by the " Dipped Brick " technique, forms a tough resistant glaze that retards the build-up of Carbon and Slag and extends the " maintenance free " life of the lining.

These undesirable deposits will eventually form, but DOHMseal ensures their easy removal without damage to the refractory lining.

Fuel saving and reduced maintenance costs result from the use of DOHMseal, which more than pays for the small expenditure incurred.

Repair refractory linings and fabricate monolithic refractory shapes with DOHMpatch—finish with DOHMseal.

CENTRAL ELECTRICITY AUTHORITY, STOKE GENERATING STATION.

Close-up of slag adherence chipped away, showing DOHMseal treated bricks beneath. Without the application of DOHMseal the boilers need to be rebricked every six months.

By treating bricks with DOHMseal, which allows easy removal of slag, there is no necessity to rebrick for a year or more.

Write or telephone for full details:

MELLOR MINERAL MILLS LTD

ONE OF THE DOHM GROUP OF COMPANIES

Etruria Vale,
Stoke-on-Trent,
Staffs.
Stoke-on-Trent 23441/5

Hargreaves *in action!*

for fuel-wise oil users

Hargreaves supply the finest fuel oils to an increasing number of users in homes and industry. Their modern road tankers provide a steady, reliable delivery service, as part of the Hargreaves desire to give the utmost satisfaction. Their Technical Staff are always at hand to offer free advice on oil installations, large or small, and the probable running costs.

For impartial information about Coal, Coke and Fuel Oil, you can rely on Hargreaves.

Why not ask our representative to call?

HARGREAVES

FUEL DISTRIBUTORS

Bowcliffe Hall, Bramham, Boston Spa, Yorks. *(Phone Boston Spa 2081)*

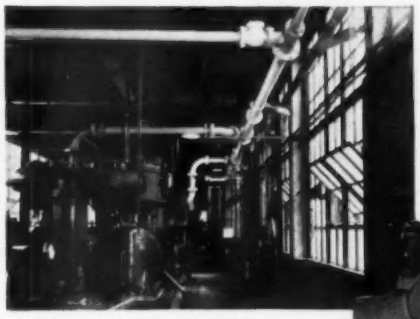
LEEDS • LONDON • HULL • GOOLE • NEWCASTLE • GLASGOW • SUNDERLAND • BRADFORD • HARROGATE HUDDERSFIELD • SCARBOROUGH • BLACKBURN • MANSFIELD • MIRFIELD • ROTHWELL • MILFORD HAVEN

11520d

Just one of the many applications for the

VOKES GENSPRING Sway Brace

Here's the Vokes Genspring Sway Brace at work—this time on compressor branch lines at the Ipswich Factory of Crane Ltd. Designed to eliminate shock or vibration, the Non-Resonant Sway Brace is equally suitable for steam lines, exhaust lines, hydraulics and other applications. Available in nine different spring sizes, housed in two sizes of casing, Sway Braces cover an initial loading range from 92 to 1,500 lbs.
Vokes Genspring Constant and Variable Support Hangers, together with the Sway Brace, offer complete pipe support for every type of installation. Send for full details of the Vokes Genspring suspension systems.



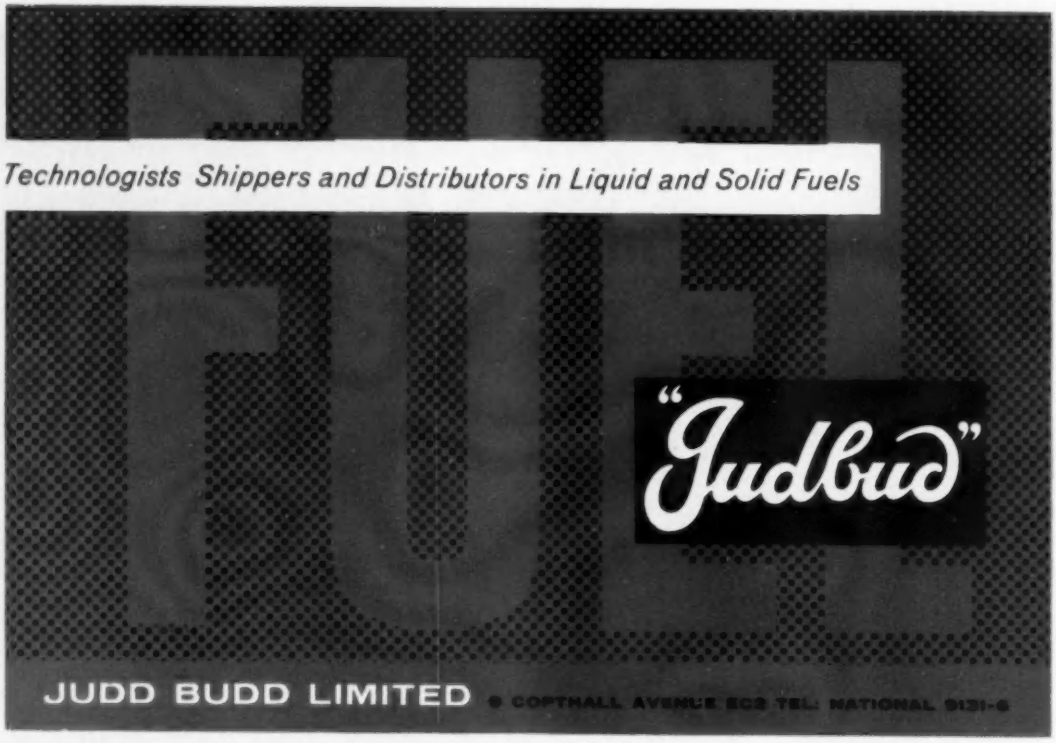
Sway Braces in the Compressor House at Messrs Crane Ltd., Ipswich.

Close-up of Vokes Genspring Non-Resonant Sway Braces.

VOKES *Genspring* **SUSPENSION SYSTEMS**

VOKES GENSPRING LIMITED · GUILDFORD · SURREY

VG/23



REAVELL ASKANIA REGULATORS

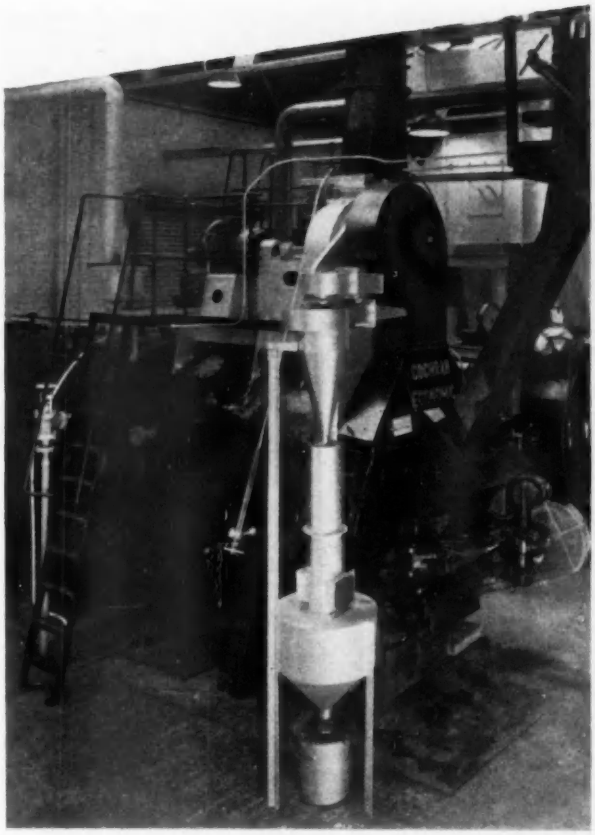
Combustion Control for Boilers and Furnaces of all types, Pressure, Vacuum, Mixture and Temperature, Regulators for Gases, Steam, Air, Liquids,

. . *FOR* . .

GAS WORKS, COKE OVENS, BOILER PLANT, STEEL AND CHEMICAL WORKS AND INDUSTRIAL PLANTS GENERALLY.

Write for particulars, mentioning this journal.

REAVELL & Co., Ltd., Ranelagh Works, Ipswich.



A Sturtevant "Newgate" Collector being used with a Cochran Economic boiler.

Cleaner Air with the

STURTEVANT

"NEWGATE" GRIT COLLECTOR

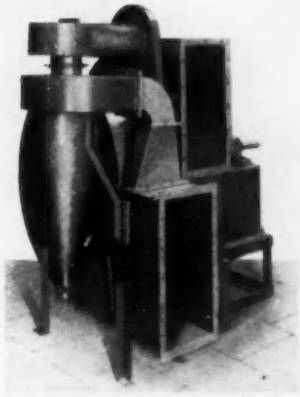
A combined induced draught fan and grit collector.

High efficiency maintained over wide range of boiler load.

Readily adaptable to all types of Shell boilers.

Compact arrangements occupying the minimum space.

for hand and stoker-fired boilers



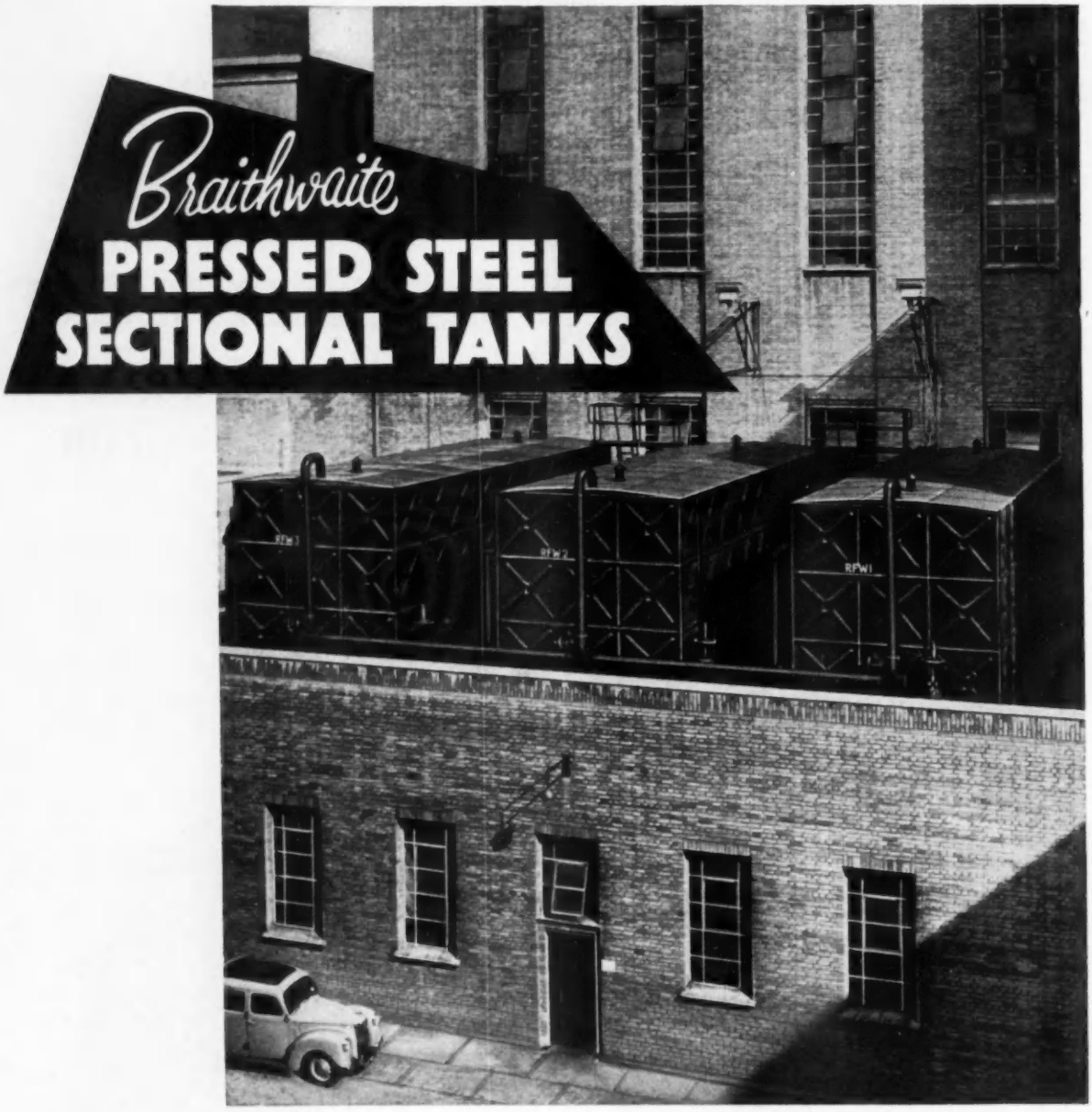
A "Newgate" Collector for use with boiler capacities in the range of 4,000 to 10,000 lb. of steam/hr.

Particulars are given in our publication J 3503

STURTEVANT ENGINEERING CO. LTD.

Southern House, Cannon Street, LONDON, E. C. 4.

AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD. 400 SUSSEX STREET SYDNEY N.S.W.



Braithwaite Pressed Steel Tanks with external flanges throughout comply with British Standard 1954: 1949. The sectional method of construction enables tanks with an unlimited range of capacities to be provided. Suitable for the storage of most liquids and viscous substances, they can be economically transported and erected in positions inaccessible to other forms of construction. They can also be increased in size when additional capacity is required. Illustrated brochure will be sent on application.

Selling Agents

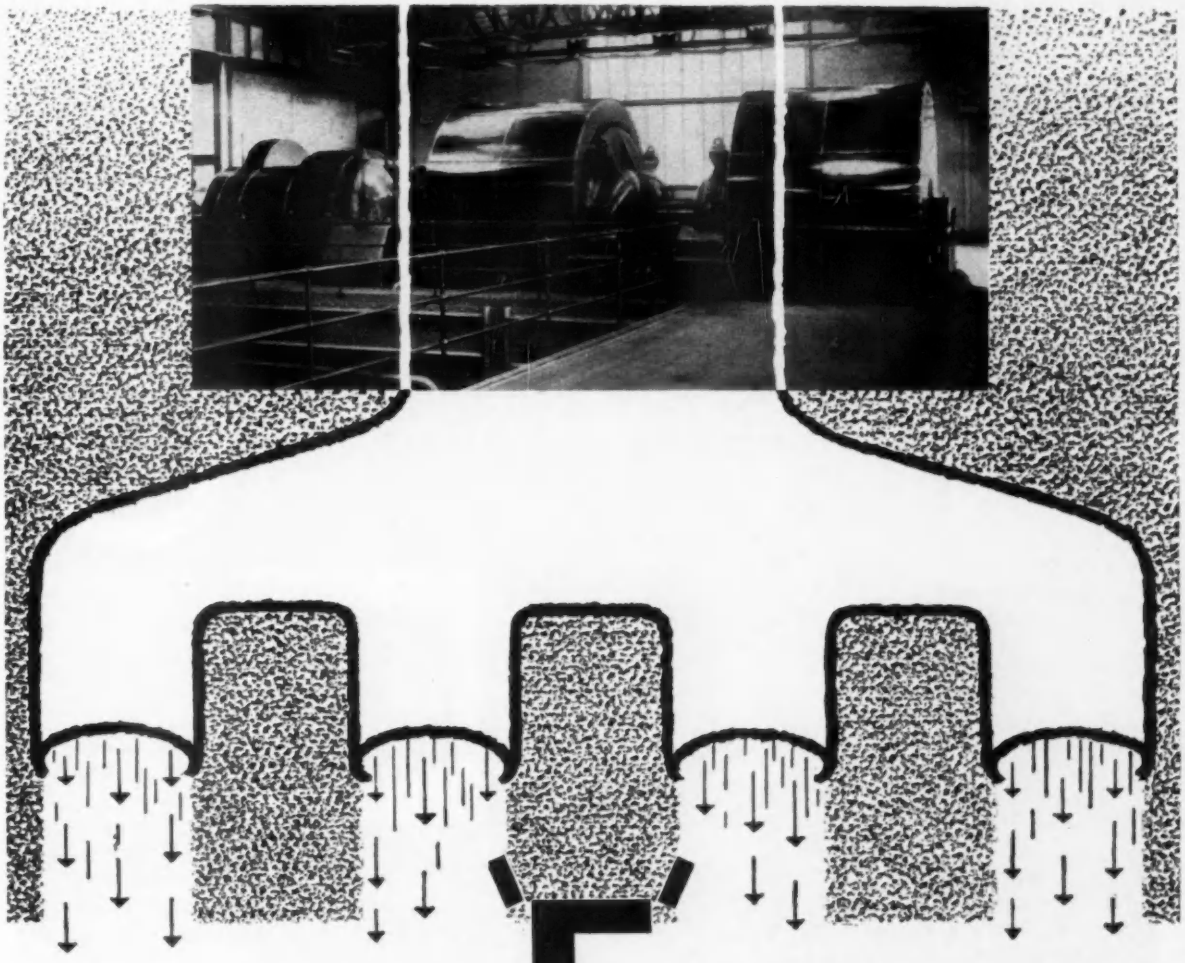
THOS. W. WARD LIMITED

ALBION WORKS · SHEFFIELD

TELEPHONE: 26311 (22 LINES) · TELEGRAMS: "FORWARD·SHEFFIELD"

LONDON OFFICE: BRETTENHAM HOUSE · LANCASTER PLACE · STRAND · W.C.2

BT/27



GIANT 'E' BLOWS

The world's largest turbo-blower was built and installed by Parsons at the Scunthorpe Works of the Appleby Frodingham Steel Company Branch of the United Steel Companies Limited.

Known as the 'E' Blower, it is designed to supplement the output of the four smaller turbo-blowers, also built and installed by Parsons, or to act as a separate unit blowing air direct to any one, or two, of the four blast furnaces at this modern iron works.

PARSONS

TURBO-BLOWERS

'E' Blower is capable of delivering 160,000 cubic feet of free air per minute at a pressure of 35 lb. p.s.i.

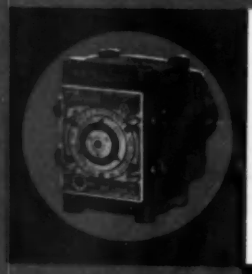
C. A. PARSONS & COMPANY LIMITED · HEATON WORKS · NEWCASTLE UPON TYNE 6

Danfoss

PRODUCES ALL CONTROL APPARATUS FOR

HIGH PRESSURE OIL BURNERS

Control Boxes with thermal flame control
Control Boxes with photo-electric flame control
Pump units for oil burning plants
Ignition transformers
Ignition electrodes
Oil burner atomising nozzles
Safety thermostats
Oil strainers
Manually operated valves
Check valves



In addition the Danfoss main catalogue No. 5, concerning all control apparatus for heating plants, as well as any other of our prospectuses, will be gladly sent to you on request.

PAY A VISIT
TO OUR STAND
F 22
AT THE
FACTORY EQUIPMENT
EXHIBITION
7th-17th APRIL

Danfoss

AUTOMATIC CONTROLS AND EQUIPMENT
13 Queensway, London, W.2
Telephone: BAYswater 9321

Engineering and BOILER HOUSE REVIEW

THE OLDEST ESTABLISHED STEAM ENGINEERING PUBLICATION

APRIL 1959

VOLUME 74. No. 4

Principal Contents

	Page
EDITORIAL NOTE	99
POINTS AND POINTERS	100
FUTURE POWER STATION AND INDUSTRIAL WATER SUPPLIES	102
THE EFFICIENT VENTILATION OF A STEAM POWER STATION	105
A CURTAIN-TYPE GRIT AND DUST ARRESTOR	109
POWER PLANT PROGRESS DURING 1958	111
GOVERNORS FOR PRIME MOVERS	118
ENGINEERING, MARINE, WELDING AND NUCLEAR ENERGY EXHIBITION ...	120
LATEST POWER PLANT PATENTS	134
NOTES—PERSONAL AND INDUSTRIAL	138

The Editor will be glad to receive and consider original contributions, correspondence, etc., of a suitable nature for publication. Stamped and addressed envelopes should be enclosed for the return of any matter considered unsuitable

Published monthly by

ENGINEERING REVIEW PUBLISHING CO. LTD.
19-20, NOEL STREET, LONDON, W.1

Annual Subscription Rate, 40s., including postage.

Telephone
Gerrard 8811

Telegrams
" Farsighted, Wesdo London "

An outstanding installation of

OIL-FIRED *industrial* BOILER PLANT

The covered firing-aisle showing the boiler fronts with their fuel-oil firing equipment.

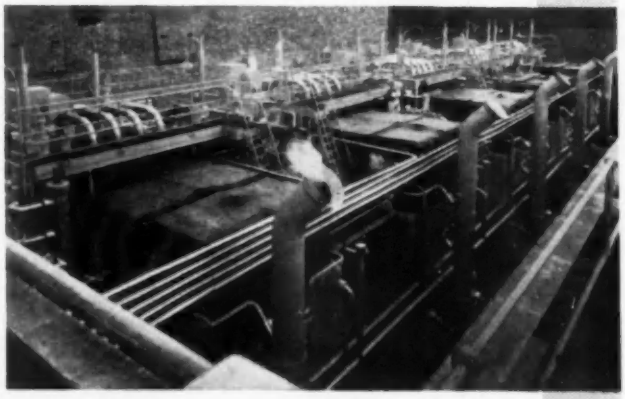
The illustrations show the fine new installation of Babcock oil-fired Bi-drum boilers supplying steam for power-generation and processing, through back-pressure turbo-alternators, in the Stork Margarine Works of Van den Berghs and Jurgens Ltd., Purfleet.

The five boilers, each rated at 36,000 lb./hr. M.C.R., at 425 lb./sq.in., 680° F, are of the "outdoor" type, with only the firing-aisle, control equipment and auxiliaries under cover, so eliminating the capital cost of a boiler-house. Oil-firing is by means of 'Y-jet' wide-range steam-atomizing burners, of which there are 3 per boiler, using 3,000-seconds fuel-oil.

The whole of the fuel-oil pumping-and-heating plant and most of the high and low pressure pipework also were designed, manufactured and installed by Babcock & Wilcox.

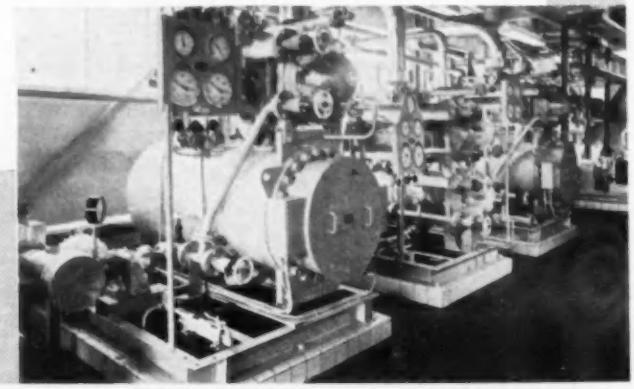
This boiler plant replaces a previous Babcock installation which had served this factory well for over 40 years.

(Consulting Engineers: Merz & McLellan).



(Above) The "outdoor" installation of five Babcock Bi-drum boilers.

(Below) Babcock fuel-oil pumping and heating units in the pump-bay serving the boiler plant.



BABCOCK

BABCOCK & WILCOX LIMITED

BABCOCK HOUSE

209 EUSTON ROAD, LONDON N.W.1

We are exhibiting at The Engineering, Marine, Welding and Nuclear Energy Exhibition, Olympia—16th to 30th April, 1959. Stand No. 3, Row G, Ground Floor, Grand Hall.

Engineering and
BOILER HOUSE REVIEW

APRIL 1959

VOLUME 74 No. 4

ELECTRICAL PLANT AND EQUIPMENT MANUFACTURE

FOR a number of years the industry concerned with the manufacture of electrical plant and equipment has been a prosperous and expanding one, and it has in general suffered less than many other industries, from the difficult and perhaps disappointing trade and economic conditions which have prevailed during the past year or two. In spite of keener and increasing competition both at home and abroad, which has resulted in somewhat lower profit margins for many of the manufacturing companies, manufacturers of electrical plant and associated equipment can, in general, look forward to a growing demand throughout the world for their products in both the industrial and domestic spheres.

Upon studying the report for 1958-59 of the British Electrical and Allied Manufacturers Association (Incorporated), we find that in 1958 for the third year in succession, exports from the United Kingdom of electrical and allied products totalled more than £270 million. This compares with the 1938 figure of £25 million, when Britain was the world's largest exporter of electrical products. The actual total of £276.4 million represented a decrease of 1 per cent. compared with the preceding year; but was £3.9 million higher than in 1956. This comparatively small decline was not altogether unexpected, for the grand total of all United Kingdom exports fell by approximately 2 per cent. below the 1957 figure. So far as individual items were concerned, the most notable decrease in electrical products was in cables and wires, attributed by the manufacturers of cables to the unusually high volume of orders received during the preceding two years. If, however, this item is not considered, all other electrical exports increased by £7.2 million, or 3 per cent. over 1957.

Exports to the Commonwealth last year increased from 54.3 to 57.6 per cent. Exports of heavy electrical machinery in 1958 reached the record figure of £81 million. Included in this was a record figure for exports of steam turbo-alternator plant which amounted in capacity to 1,130-MW compared with 900-MW in 1957. Exports to the North American market were a record in 1958, and more than £10 million worth of heavy electrical machinery and associated plant was sold to Canada and the U.S.A. These two countries now buy nearly 10 per cent. of the industry's total sales abroad. In 1958, electrical exports formed more than 10 per cent. of all United Kingdom exports of manufactured products.

It is pointed out in the report that although the electrical industry did not experience such a drastic reduction in the volume of orders as did some other industries, order books are not as full as they have been. Owing to improved methods of production and quicker deliveries of materials, many manufacturers can show an increase in output, but the resulting economics have been virtually offset by rising labour costs, and, furthermore, keener competition has meant reduced profit margins. With the recovery in employment, during the second half of 1958, the total number of workers in the industry in December was 726,900, which was less than one-half of one per cent. down on the December 1957 figure.

Since 1950, the annual production of heavy electrical generating plant in the United Kingdom has increased by more than 60 per cent. and the annual production capacity of the Industry now exceeds 3,000-MW. The annual rate of commissioning new plant throughout the United Kingdom is now approximately 2,000-MW. During 1958, a total of 20 units with an aggregate installed capacity of 1,350-MW were commissioned for the Central Electricity Generating Board and The South of Scotland Electricity Board. These figures include the first two sets of 120-MW capacity—one of them for the Scottish Board. The C.E.G.B. figure of 1,230-MW compares unfavourably with 1,903.5-MW for 1957 and 1,920-MW for 1956. This is largely due to the Government's policy of restricting capital expenditure in the nationalised industries during the period of financial stringency as far back as 1953. In industries such as the electricity supply and manufacturing industries, which have to make long term plans for their capital investment, any unexpected curtailment in the investment programme results in inefficient execution.

In addition to the 120-MW sets already mentioned, sets of 200-MW, 275-MW and 550-MW are in course of construction. As we pointed out in a recent issue of this journal, the use of these larger generating sets, operating at higher steam temperatures and pressures has enabled the unit capital investment cost to be held virtually constant over the last ten years, despite increases in wages and costs of materials during the period. The increase in the size of individual generating sets which are being ordered without any corresponding increase in the programme of commissioning, has meant that the number of sets ordered has been fewer, and this brings with it many problems for the manufacturers.

Points and Pointers

ATOMIC RESEARCH CENTRE FOR BERKELEY

At a cost of about £1 million, a new research centre is to be established by the Central Electricity Generating Board, adjacent to the Berkeley Nuclear Power Station, Gloucestershire. It will consist of engineering, physics, metallurgy and chemistry laboratories. The research centre will be self-contained and administratively divorced from the power station, although architecturally the buildings will be in keeping with others on the site. In siting these laboratories, the board has had in mind the proximity to the universities in the south-west of England and South Wales. There will be openings for all types of staff, and the total number to be engaged will be about 150-200—composed of scientists, chartered technologists, and skilled and unskilled tradesmen. The board will, therefore, look for students of applied and natural sciences from the universities, and from local grammar and technical schools. It will arrange for promising candidates to be trained in the sciences by part-time release for attendance at technical colleges and the award of full-time scholarships at appropriate universities. One of the functions of the laboratory will be to give a constant appraisal of the state of materials used in the construction of the reactors by detailed examination of monitor samples removed on a programmed basis from the board's operating reactors. In the physical laboratories, work will be carried out on experimental programmes in nuclear and reactor physics and considerable experimental studies will result from the programme devised for monitoring the behavior of the graphite, which forms the reactor core, and the problems arising from a study of reactor physics during the commissioning period of reactors and thereafter.

ATMOSPHERIC POLLUTION

A report on the Investigation of Atmospheric Pollution in the year ended March 31st, 1957, has been issued by the Department of Scientific and Industrial Research (H.M. Stationery Office, 7s. 6d.). Of its 136 pages, 124 are allocated to tables relating to the situations of measuring instruments and their types, deposited and suspended matter, SO_2 concentration in different areas and similar information. Matters of chief electrical interest concern sulphur output and wind around Staythorpe power station. The observations confirmed that pollution was correlated with sulphur emission and could be fairly closely estimated at ground level by a plume of gas emitted from a chimney in a strong wind. The accumulation of pollutants was, however, greatest in light winds and no theory so far devised predicted the behaviour of hot gases in these conditions when the air was stably stratified, as during temperature inversions; experimental investigations were being made at Imperial College, London. No known method for determining sulphuric acid in the presence of sulphur dioxide had proved satisfactory and further research was required. There was also a need for continuous records of concentrations of sulphur dioxide, for which the Central Electricity Generating Board had developed instruments to be available commercially. Sulphur dioxide had been removed from flue gas by scrubbing with water containing manganese dioxide in suspension; an efficiency of 96 per cent. was maintained even when the concentration of sulphuric acid produced reached 40 per cent. The initial product from the scrubber was 40 per cent. sulphuric acid containing about 20 per cent. of manganese sulphate in solution, which was removable by electrolysis and regenerated manganese dioxide. All the manganese sulphate had not been decomposed economically, however, to leave sulphuric acid of saleable purity.

INSTITUTION OF PLANT ENGINEERS

The twelfth annual conference of The Institution of Plant Engineers is to be held on May 6th-8th at the Old Swan Hotel, Harrogate, and will be the occasion of a number of authoritative papers of wide scope and interest. In view of the exceptional response to similar invitations in the past two years, the Council of the Institution is again making the conference available to a limited number of non-members by inviting some of the principal industrial concerns to nominate senior staff to attend. Following the presidential address by Mr. W. M. Barber, M.A. (Cantab.), A.M.I.Mech.E., two principal papers are to be presented and discussed. The respective authors are Mr. P. Mayne, M.A. (Cantab.), M.I.Mech.E., technical director of the Billingham Division of Imperial Chemical Industries Limited, and Mr. John Leyland, M.Sc., M.I.Mech.E., head of the Engineering Section, Central Research Department, Unilever Limited. Mr. Mayne's paper has as its subject "Management in Plant Engineering," while Mr. Leyland will consider "The Value of New Materials and Techniques in the Solution of Engineering Problems." In addition, there will be group discussions on various papers, including: (a) "The Pros and Cons of Systematic Control and Planning in the Engineering Department," by G. A. Hutcheson, M.Sc., B.Sc. (Eng.), etc., assistant manager, Central Work Study Department, Imperial Chemical Industries Limited. (b) "Meeting the Requirements of the Clean Air Act," by D. C. Gunn, M.Sc., B.Sc.(Eng.), etc., chief engineer, Cochran & Co. (Annan) Ltd., and R. J. Jackson, Ph.D., M.Inst.P., superintendent, Physics Department, The British Coal Utilisation Research Association. (c) "Trends of Development in Factory Design and Equipment," by E. C. Stevens, M.A. (Cantab.), B.Sc. Tech., etc., group services manager, Wm. Birtwistle Allied Mills Limited, a vice-president of the Institution. The conference dinner will be held on the Thursday evening when the principal speaker will be Sir Harry Pilkington (chairman, Pilkington Brothers Ltd.), past president of The Federation of British Industries and chairman of the National Advisory Council on Education for Industry and Commerce.

SCOTLAND'S FIRST NUCLEAR POWER STATION Scotland's first nuclear power station at Chapelcross, near Annan, Dumfriesshire, is now producing electricity. The first of the four reactors there came into use for electricity generation at the end of February. This reactor, which went critical last November, has concluded its testing and commissioning period, and steam has been produced in the associated heat-exchangers for some time. With the completion of the steam circuit and associated turbo-alternator the steam, which had previously been passed to a dump condenser, can now be fed to the turbine. The Chapelcross station, which will ultimately have a generating capacity of 184-MW and will, when all four reactors are completed, feed about 140-MW to the national grid, has been built by the United Kingdom Atomic Energy Authority as a dual purpose station to provide plutonium and electricity. Another nuclear power station in Scotland is that being built by the South of Scotland Electricity Board at Hunterston in Ayrshire for the provision of electricity and will supply 320-MW of power to the grid. The construction of Chapelcross is under the control of Messrs. Merz & McLellan, acting as agents for the Atomic Energy Authority's Industrial Group, the first occasion on which a private firm has been employed in this way on a major project. The official opening of the station will be on May 2nd.

BRITISH GENERATING SET FOR U.S.A. Elsewhere in this issue we include a reference and diagrams concerning the 500-MW turbo-alternator set for the Tennessee Valley Authority of America, for the supply of which set, C. A. Parsons & Co. Ltd. have received a 12 million dollar contract. In view of the growing pressure exerted by the American electrical engineering industry on the Office of Civil and Defence Mobilisation to secure an embargo on the importation of most types of heavy equipment, the award of this particular contract to C. A. Parsons is of considerable interest. The famous Newcastle firm have, of course, previously supplied heavy electrical plant to the United States. In 1912 they first supplied a 25-MW set to the Commonwealth Edison Company, for that company's Fisk Street power station in Chicago, which proved to be larger and more efficient than any set in the world at that time. Ten years later they supplied a 50-MW set to the same company for their Crawford Avenue (Chicago) power station, which on test after 18 months' operation showed a thermal efficiency of 34.02 per cent., a remarkable figure at that time. The 500-MW machine now on order for the Tennessee Valley Authority is claimed to be the largest turbo-generator projected in the world apart from a 550-MW unit which Parsons are building for the Central Electricity Generating Board station at Thorpe Marsh. The American industry lodged its appeal for a general embargo on national security grounds more than a year ago, but the order to Parsons is the first steam-turbine contract to be placed abroad. It has been followed by a successful bid by the Swiss Brown, Boveri for two steam turbines required by the Los Angeles power commission. In both cases the American tenders exceeded the overseas bids by really substantial amounts; Parsons tender figure of 12 million dollars which was said to be 5 million dollars below the lowest American tender, while Brown, Boveri are reported to have quoted 9.3 million dollars against the American General Electric tender of 14.8 million dollars. President Eisenhower has expressed the view that the American manufacturers are running the risk of pricing themselves out of both home and export markets and it is difficult to see how the industry's appeal on national security grounds can be substantiated, particularly since the Tennessee Valley Authority have announced that in the case of the Parsons contract repair facilities are available in the event of an emergency in Canada.

INTERNATIONAL CLEAN AIR CONFERENCE We understand that the National Society for Clean Air is organising an International Clean Air Conference and Exhibition, to be held in the Seymour Hall, London, from October 20th to 23rd. Although the conference will emphasise the technical and administrative means for securing clean air, rather than the purely scientific and medical study of atmospheric pollution, all aspects of the problem will be included. The society says that, so far, nearly 50 overseas delegates have been appointed, representing 15 countries. An invitation to be represented will shortly be going out to British local authorities, organisations and firms. An open invitation to submit short written contributions for the several conference sessions has already been made to overseas bodies, and to date about 30 contributions have been offered. The invitation is now being extended to those in this country who may be able to make technical or research contributions of international interest. All accepted contributions will be printed and distributed in advance and will be discussed rather than read at the conference. Proposals for contributions should be made to the Director, the National Society for Clean Air, Palace Chambers, Bridge Street, London, S.W.1.

UNITED KINGDOM ATOMIC ENERGY AUTHORITY Changes in the organisation of the United Kingdom Atomic Energy Authority to be effective from July 1st, 1959, were announced on March 20th. Hitherto the Authority has been made up of three Groups: the Research Group, the Weapons Group and the Industrial Group. The Industrial Group, which has become too large for convenient management, will now be divided into two: the Development and Engineering Group, and the Production Group. At the same time, the full-time technical members of the Authority will again assume executive responsibility for particular groups, in addition to their functional responsibilities and general duties as members of the board. Sir William Cook, with the title of *Member for Development and Engineering*, will be executive head of the Development and Engineering Group and will in addition retain corresponding functional responsibilities through the Authority. Sir Leonard Owen will have the title of *Member for Production* (Designate) and will be the executive head of the Production Group. Sir William Penney, whose appointment to succeed Sir John Cockcroft as the *Member for Scientific Research*, has already been announced, will in addition become the executive head of the Research Group, while retaining his functional responsibilities for scientific research throughout the Authority. The appointment of a successor to Sir William Penney as *Member for Weapons Research and Development* will be announced later.

Future Power Station and Industrial Water Supplies

by S. B. Jackson*

RECENTLY, two White Papers have been published in reference to information on water resources and the growing demand for water in Great Britain†. They deal with the work of two sub-committees which have been investigating these aspects of water supplies. In general, they cover a broad field; but as far as engineering is concerned they confine themselves to water supplies to power stations and industry.

Nationalised industries

The nationalised industries—electricity, coal, gas and transport—provided particulars of demand in 1955 and, in most cases, estimates for 1965 apart from supplies of water for cooling, indicate that the requirements of these industries are not great. The demand for cooling water is immense; the Central Electricity Generating Board expects to require some 10,000 million gallons a day *gross* for cooling in 1965, or more than twice the total demand by all other users. However, only a small fraction of this great quantity is consumed—that is, evaporated or otherwise lost—and if the gross amount were included in the total demand it would, obviously, be erroneous. A high proportion of the gross quantity is sea or estuarine water and hence does not represent any demand on national resources.

Cooling water requirements in the nationalised industries have been excluded from the estimates of total demand, but water used for other purposes, together with an allowance representing the *net* cooling requirements (i.e., water actually evaporated in cooling towers) of the Central Electricity Generating Board, has been included with the industrial figures.

Central Electricity Generating Board requirements

An approximate evaluation of the circulating-water gross daily quantity may now be made. Only a rough and broad estimate of the probable national operating conditions for 1965, such as station thermal efficiency, type of plant installed, system peak demand, load factor, etc., is feasible. By intelligent anticipation it is possible to arrive at the approximate conditions in that year.

The estimated installed plant capacity is 29,500-MW, which, with a system reserve of 12.5 per cent., gives a probable simultaneous system peak load of 26,000-MW. This pre-supposes all plant in service on the day of the peak in order to meet outages, transmission line failures, and to satisfy inter-division or area inter-changes of power, etc. At a peak day daily load factor of 67.5 per cent., a daily generation of 420 million kWh is obtained.

Regarding the system thermal efficiency as having advanced to 30.0 per cent. (sent out) by 1965, this gives 11,350 B.Th.U./kWh heat in fuel. Making an overall station heat balance for this thermal efficiency, and allowing for works auxiliary power, boiler house losses, turbine house losses, and assuming a probable average boiler and machine capacity (which will give the probable average pressure, temperature, vacuum, and feed-heating of the average cycle), we find that about 47.5 per cent. of the initial heat in the fuel will be rejected to the condenser. This corresponds to about 5,500 B.Th.U./kWh. With a probable average circulating-water temperature rise of 12.5 deg. F. we thus obtain 440 lb. circulating water/kWh output which gives 18,450 million gal./day total circulating requirements from all sources.

Of the 29,500-MW of plant in commission, this will include approximately 5,500-MW of nuclear plant, leaving a balance of 24,000-MW of steam plant. The nuclear stations being located on seaboard or estuarine sites will, of course, obtain their circulating-water supplies accordingly.

The balance of 24,000-MW of steam plant may be roughly divided into the proportions of 35 per cent. seaboard and 65 per cent. inland. These inland stations create the demand upon the national water resources. While proportionality is not strictly accurate in allocating the respective demands, because of differences in circulating-water temperatures, e.g., the stations taking their supplies from the sea will generally have lower inlet temperatures than those taking supplies from already-heated rivers, it is nevertheless indicative of the broad respective amounts required. For inland stations an estimated figure of 9,800 million gal./day on the day of the peak is arrived at. This closely approximates the value given in the water resources reports referred to.

The effect of seasonal water temperatures upon vacuum, steam consumption and, hence, circulating-water quantity related to seasonal system loads has been calculated. This shows that although the load is substantially less in the summer than in the winter months, the daily value of 10,000 million gallons applies because of the higher inlet temperature. But under adverse weather conditions producing low river flows and exceptionally high circulating-water inlet temperatures, the daily value may rise considerably above this. It is, therefore, fortunate that the net abstraction is on account of evaporation only. The development of algae due to the high river temperatures, the effect upon fish and other natural life, not to mention industrial and public health considerations, may well dictate a different policy in reference to the siting of large new steam stations. The trend in regard to certain seaboard steam stations and nuclear stations may be noted in this connection.

Regarding make-up for boiler feed purposes, considering the average steam consumption as being in the neighbourhood of 7.5 lb./kWh output on the day of the peak, with an average make-up of 2.5 per cent., this calls for 78.5 million gal./day, which brings up the total to 9,878.5 million gal./day.

*Consulting Engineer.

†*H.M. Stationery Office*; 1959; 1s. 3d. *each.*

This gives a broad evaluation and takes no account of evaporation from cooling towers, water required for transformer and other equipment cooling, but it is sufficiently close as to present the picture in its correct perspective.

Other nationalised industries

In the coal industry, water is principally used for power generation, and coal-washing purposes. This industry, however, extracts large quantities of subterranean water, and the effect of this may be to make some contribution to the coal industry and general supply.

The use of water in the gas industry is principally in connection with quenching of coke—the total water consumption being about 150 million gal./day.

The present trend of dieselisation in rail transport will reduce the water demand by this industry very considerably.

Industry

Industry uses water ranging in quality from distilled water to polluted tidal water. Potability is not necessarily a criterion of suitability, because mineral constituents which may be wholesome for human consumption may be detrimental to industrial plant and processes. Water treatment by industry for its special uses is often essential and may in some instances be technically difficult.

On the other hand, industry is largely responsible for causing a large amount of pollution; while public sewage authorities in some cases pour into our rivers large volumes of only partially treated sewage. The sources of supply of water for industry are either from public water undertakings or private boreholes, wells, river intakes or canals. About 30 water undertakings supply untreated or partially treated water for industry.

The reports to which reference has been made suggest that while there is an infinite number of sources of supply, it is nevertheless difficult to obtain a complete view of industrial water demands, because of the extensive and detailed investigation that would be required. It is, however, believed that supplies will be adequate in the year of reference of 1965, and that more water will be readily found in most areas of Great Britain as and when required. It would appear that the brewing, chemical, steel, leather, paper-making and textile industries are the largest industrial users of water, and probably the more important polluters of water. It is likely that in the future, the largest constituent cost of water may be the cost of treatment of polluted waters which will require special techniques and plant.

National water demand trend

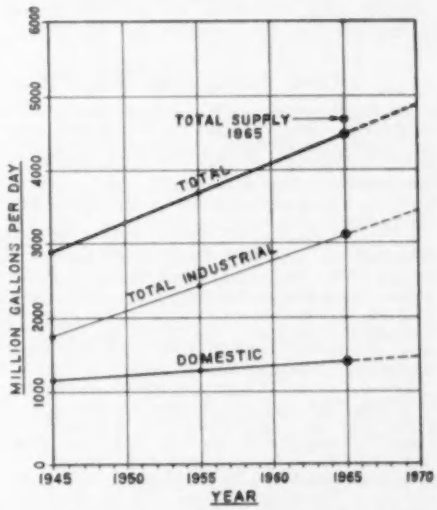
The general national trend of water demand is shown in Table 1. The estimates for 1965 for public water supplies and the nationalised industries are fairly accurate, but owing to the difficulty of obtaining similar accurate information from industry, the industrial values must be regarded with caution.

It is seen that industry is approaching the limit of its own internal resources, and increasing demand is being made upon the public water utilities. Regarding the increase of total demand which amounts to 2.7 per cent. per annum, this is moderate, but it is nevertheless greater than the increase of population during the period reviewed.

TABLE 1
Water Supply and Demand in England and Wales

	Gross Demand			Supply	Demand Increase
	1945	1955	1965	1965	1945-55
	(million gallons per day)				Per cent.
Domestic (Public Water Undertakings)	1,140	1,228	1,367	1,835	8
Industrial (Public Water Undertakings)	450	780	1,040	1,150	73
(Own Industrial Sources)	1,300	1,668	2,083	1,668	28
Total	2,890	3,626	4,490	4,653	27

The statistics given are also shown graphically for convenience in Fig. 1. On present estimates, average supplies of water in 1965 will be only equivalent to 11 per cent. of the potential rainfall, but it will be appreciated that the amount which can be actually collected for distribution is far below this. With the present rainfall and the increasing number of water schemes for collection and distribution, there seems to be an adequate supply to satisfy the demand, except during severe drought conditions. While the position in the immediate future may appear satisfactory, future needs should not be viewed with complacency, as collection will become increasingly difficult and expensive, with appreciably greater demands per capita to be expected.



Graph showing growth of water demand 1945-1965 and the estimated supply available at 1965.

Capital cost of new water supplies

Particulars are only available referring to new public water supply works under construction and scheduled for completion by the year 1965. Some of the schemes have yet to be referred to or approved by the Ministry of Housing and Local Government, but they are sufficient to establish that, on the whole, steps are being taken to safeguard future supplies, including the increasing element of industrial consumption.

Actual plans which are in hand cover the following:—

	(million gal./day)
River Intakes	310
Reservoirs	400
Underground Sources	271
Total	981

Approximately 85 per cent. (835 million gal./day) of the works are for completion by 1965. The total value of these capital works is £300 million, or £305,000 per million gal./day. Expenditure tends to rise and it is not unlikely that by 1965 the cost will have reached £400,000 per million gal./day. This figure may be taken as representative, but for industry it may be on the low side.

From Table 1 it is found that between 1955 and 1965 the total increase of industrial water demand is 675 million gal./day, which will involve a capital expenditure for water supplies alone by industry of over £30 million. Although water schemes and water are relatively cheap, strict economy seems to be indicated on expenditures of this magnitude.

Future industrial water supplies

With the costs of construction of all types of engineering works continually rising, and with the insistent pressure of manufacturing economy in all departments, it may be expected that owners of power plants and industrial organisations will seek economy in water supplies and treatment as well as in manufacturing processes. In this connection, the processes of ion demineralisation and vapour compression distillation are of considerable importance in that they can render tidal waters suitable for public, power station and industrial application at reasonable cost, which will be probably lower than that obtained by transmission by water pipeline over long distances with final conditioning on site.

As more economical processes of vapour compression distillation are becoming available for the distillation of sea and brackish waters, it may be implied that this method has an important contribution to make in the future development of water supplies in Great Britain. Electrodialysis is another process which is being developed and several experimental plants are in use in various parts of the world, but it is not sufficiently advanced for large-scale acceptance. By virtue of the developments in vapour compression distillation referred to, this process will be a serious competitor to electrodialysis. It is thus evident that in the future considerable quantities of hard water, tidal and estuarine supplies may be economically dealt with by this type of plant for power generation and industrial process purposes. To this extent vapour compression distillation will assist in the production of public and industrial waters from sources not supplied by indigenous rainfall.

HONG KONG ELECTRIC CO. LTD.

In the description of the North Point " B " Power Station of the Hong Kong Electric Co. Ltd., which was published in the March issue of this journal, it was stated that the company itself was founded in 1925. This statement is incorrect, as we were misinformed. Actually, the company was founded in 1889, which makes it one of the oldest electrical power companies in the world.

Its first generating station was built in Wing Fung Street, Wanchai, the generating plant comprising two 25-kW steam engine-driven sets—this plant being designed to supply current for street arc-lighting. By 1912, the installed capacity of plant at Wanchai had been increased to 525-kW ; it was then decided to install diesel sets, and three 175-kW were ordered followed by four 375-kW sets, the largest sets to be manufactured at that time.

In 1915, an area of foreshore was purchased by the company at North Point, and this became the site of the North Point Power Station, commissioned in 1921 with two 1,500-kW steam turbo-alternator sets. By 1941, the installed capacity had reached a total of 54-MW. During the war years the station was taken over by the Japanese, and much of the plant was lost ; during the post-war years, reconstruction work was put in hand, and the station was eventually completed in 1954—the amount of post-war plant installed being of 50-MW capacity.

As stated in our article last month, the output capacity soon became inadequate, and thus in 1954 a decision was made to construct the new North Point " B " Power Station of 150-MW capacity, alongside the existing " A " Station.

Since the publication of our description of the North Point " B " Station, further information concerning the plant installed has been received. The vacuum within the condensers is maintained by two 100 per cent. duty " Hivac " two-stage, surface-cooled, air-ejectors made and supplied by Hick, Hargreaves & Co. Ltd., and designed for operation with live steam at 600 lb./sq. in. and 850 deg. F. These units naturally show a very great improvement in performance compared with the similar two-stage ejectors supplied by the same company for the original 20-MW sets in the " A " Station in 1938. In the feed-heating systems one of the l.p. heaters is of the direct-contact deaerating type, and has also been manufactured by Hick, Hargreaves & Co. Ltd. Each of these direct-contact heaters is designed to heat the condensate at full load from approximately 110 deg. F. to 178 deg. F. by the direct admission of bled steam from the turbine. The condensate, which is admitted through a series of spray nozzles, cascades over a number of perforated trays, during which process it is heated to the bled steam saturation temperature ; oxygen and other included gases being liberated. The liberated gases, and a proportion of steam vapour, are condensed in a separate vent condenser which is vented back to the main condenser. The deaerated and heated condensate is finally extracted by one of the two duplicate single-stage " Hivac " extraction pumps. All the h.p. heater drains, which are flashed into the heater, are thus pumped forward with the main condensate flow. Optimum deaeration on partial loads is achieved by the inclusion of the recirculating principle in the system whereby the full load condensate quantity passes through the heater continuously, the excess flow being recirculated to the inlet of the heater with consequent improvements in the deaerating performance. As a matter of interest it should be mentioned that Hick, Hargreaves & Co. Ltd. supplied all the feed-heating equipment and condensing plant for the original " A " Station.

The Lord President of the Council (Lord Hailsham) will open the new Warren Spring Laboratory, D.S.I.R., at Stevenage, on Monday, June 29th, 1959. The new laboratory is intended to assist Government departments and industry by resources that are not available in any other establishment of the department. It will carry out research and development in a wide field and will not be limited to particular aspects of technology. Its initial programme will include work on mineral processing, the synthesis of oils and chemicals from carbon-monoxide and hydrogen, and research aimed at the suppresion of atmospheric pollution. Much of this work will be of a chemical engineering character and will require basic chemical engineering research to be undertaken in parallel with it. The station will be free to take up any research requiring staff and facilities of the type that are being provided. For the time being, research on atmospheric pollution will continue at The Atmospheric Pollution Division, Warren Spring Laboratory, Rover Way, East Greenwich, S.E.10.

A new BEAMA publication, entitled ' Leading the World,' was issued on the occasion of the annual meeting of the Association, on March 19th. This is a complement to ' Serving the World,' published last year in connection with the Brussels Exhibition, of which publication more than 40,000 copies have already been sent overseas. Both books are being distributed widely in influential circles in this country, recipients including all Members of the House of Commons and the House of Lords. ' Leading the World ' is a 68 page book in which the first section describes the electrical industry's participation at the Brussels Exhibition, the second comprises a complete record of the 1958 British Electrical Conference at Brussels, and the third illustrates the industry's contribution to the Geneva Conference on the Peaceful Uses of Atomic Energy.

The Efficient Ventilation of a Steam Power Station

By A. G. KELLY, B.E., A.M.I.Mech.E.*

POORLY ventilated power stations fall into two categories—those which have virtually no ventilation in the vicinity of the operational areas, and those where the volume of cold air circulating in, or passing through the various buildings, is excessive. A graphical representation of the standard of comfort employed in this analysis is shown in Fig. 1. This applies to the particular climate being considered by the author in this article. The effective temperature depends on air movement, air temperature and humidity, as measured by a bulb thermometer. The "standard of comfort" is that referred to in the publication *Heating and Ventilation in Factories*, H.M.S.O., 1952. It is claimed that this "comfort zone" will satisfy at least 50 per cent. of a group of normal people. Desirable factors for such comfort are that air movement should

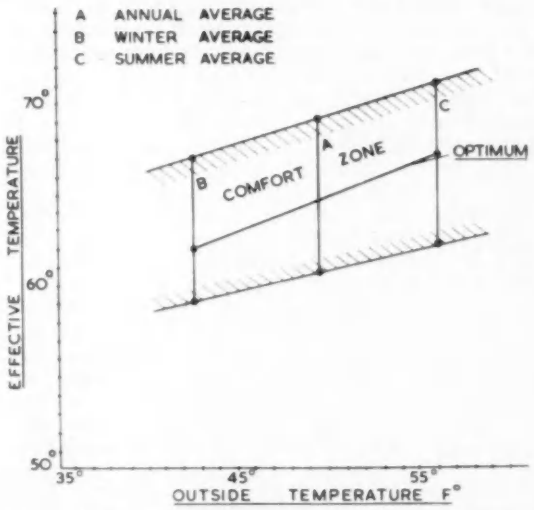


Fig. 1. Graphical representation of the comfort zone used in "Heating and Ventilating in Factories," H.M.S.O. 1952, which is claimed to satisfy 50 per cent. of a normal group of people.

be provided throughout the building, and that the higher the temperature and/or radiant heat, the higher the corresponding air movement. In a power station, quantities of heat are given off from much of the plant installed, viz.:—boilers, turbo-alternator sets, motors, steam-piping, etc., such heat obviously increasing the temperature of the air within the building to a figure depending upon the heat loss from the building and upon the scheme of ventilation used. Firstly, the amount of heat given off from the plant items depends on the efficiency of the heat insulation of such items. The various figures given in these notes could not be used as an approximation of the conditions that would exist in a station in which there are installed, boilers that radiate much less heat to the surrounding air than is normal; e.g., those boilers which have air-cooled walls; nor could the figures be applied to units with excessively great radiation. Also, the amount of heat given off is affected to some extent by the "material finish" of surfaces and this should be remembered when painting the casings of the boilers, turbo-alternator sets, and auxiliaries. As an example aluminium paint which is suitable for use on surfaces having temperatures of up to about 400 deg. F. will reduce the radiant heat loss by upwards of 10 per cent. as against most normal oil paints. Secondly, the amount of heat given off depends upon the air movement across the various surfaces; the temperature of the air is reduced with increased throughput, but the total heat given off increases. If conditions in any particular environment are not comfortable, this may be due to any one, or to a combination of a number of reasons. The air temperature may be too high; the relative humidity may be too high; radiant heat may be excessive, or air movement may be insufficient. In a power station it is a comparatively simple matter to maintain the temperature level as high as desired by reducing the air flow. The main problem is to lower the temperature or to alter the air movement or humidity in order to compensate for high temperature. It is possible to arrange for the air inlet supply for the boiler fans to be taken at a low level and then use such air at boiler top level; in this way the relative humidity of the air is gradually reduced as the air rises, with a compensating effect for the rise in air temperature which takes place. In the analysis given in these notes for all variations of ventilation actually tested, the maximum wet-bulb temperature at operating floor level was 65 deg. F., and in the building (at any height) 72 deg. F., with an outside relative humidity of up to 88 per cent. At high temperatures the humidity is the factor which has the greatest effect on comfort. While Ireland (the country considered in these notes) has a moderate climate during the summer season (average temperature 56 deg. F.), the relative humidity for the whole year averages 85 per cent. In case 3(c) in these notes, for example, humidity was 84 per cent. outside, 50 per cent. at operating floor level and 27.5 per cent. at boiler top level. This drop in humidity compensates for the rising temperature to the extent of 5 deg. F. at operating floor and 8 deg. F. at boiler top level. The radiant loss from large industrial boiler units is such that if adequate ventilation at boiler top level is not provided, that particular zone would be unbearably hot. In the older installations here considered [see diagrammatic arrangement Fig. 2(i)], the forced-draught fans are located at basement level and draw

*Electricity Supply Board, Ireland.

their air supply from outside the building and through doors at that level. In consequence, it was found necessary to provide roof louvres to carry off the excess heat from the top of the boiler house by means of natural ventilation. At the same time, the turbine house, which is separated from the boiler house by a dividing wall, and which was originally supplied with ventilating (extraction) fans in the roof, but with no proper means of air supply to pass over the hot surfaces of the plant, was so unbearably warm during the summer months that a cold-air plenum system was installed; thus, the advantage of having,

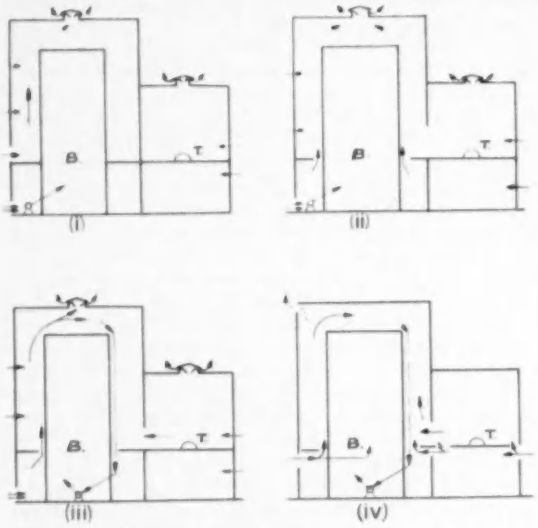


Fig. 2. Four schemes of ventilation of a power station. (iv) is the optimum. B-Boiler. T-Turbo-alternator set.

at no additional expense, the boiler fans to ventilate the complete building was overlooked. With the advent of improved plant design, air for combustion requirements was taken from roof-level to utilise the advantage of the higher air temperature; but the open roof-louvres remained as a relic of the older scheme. It was probably argued that as there was a vast quantity of hot air flowing through the roof louvres, if these latter were dispensed with, working conditions would be extremely uncomfortable.

A second example [shown diagrammatically in Fig. 3(d)] is a case where there are very amply dimensioned roof louvres (adjustable or non-adjustable) with fan inlet suction from boiler top level; there are, however, no openings of any consequence at low level positions in the station, and in any but the coldest weather, working conditions become uncomfortably warm. Hot air rising from the various items of plant passes out through the roof louvres, while cold air enters at the points directly over the fan suctions. The air temperature at the fan inlet is lower than that at the operating floor level. Ventilation depends upon leakage into the building and obviously is inadequate.

The scheme of ventilation here proposed utilises the chimney effect produced by the height of the station, and the suction produced by the fan drawing in air for combustion, to provide ventilation for the complete station. In effect, something approaching air-conditioning is attained without the installation of any special equipment. The adoption of such a scheme at the design or planning stage costs very little, as the elimination of the necessity for providing roof louvres will balance the costs, whereas if the station is already constructed with inadequate ventilation, it may prove to be costly to carry out the necessary alterations.

It is of interest to note that air flowing in through openings does not flow directly upwards by the shortest (and perhaps the easiest) path to the fan suction, but moves via the hotter surfaces. It is better to provide adjustable louvres to allow for air inlet, because if such provision is not made, various doors are left open (particularly those of the roller-shutter type), when once it has been found necessary to open them on a particular occasion to improve ventilation and thus provide a greater measure of comfort for the operating personnel. The custom of leaving the doors open often becomes a regular habit, and should not be allowed.

Air movement is controlled and directed by allowing the requisite amount to enter the building through adjustable louvres over "head-height" in the basement, and allowing the air to rise through the building, thus providing ventilation with no attendant draughts. In this way, compensation for high radiant heat and air temperature is effected. During tests it was found that the air movement upwards near the boiler steel-casing and through open columns averaged 4.5 ft./sec.; the air changes per hour varied from 1 to 8 depending upon

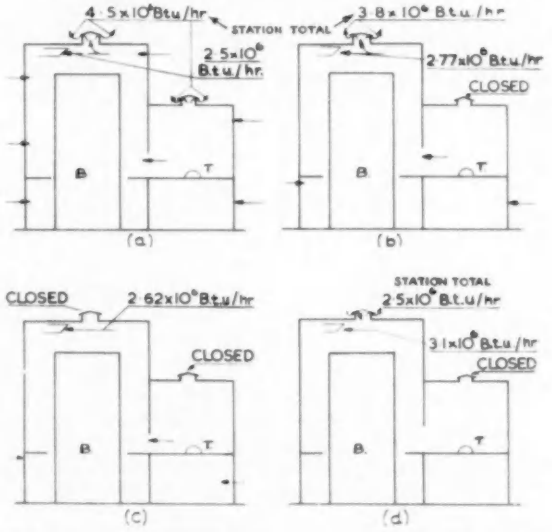


Fig. 3. The results of tests in a station with 60-MW of plant in service. B-Boiler. T-Turbo-alternator set.

the plant in use, and upon the amount of air allowed to pass across the turbine house. Fresh air is constantly entering at the lower levels of both boiler house and turbine house, the impure air being removed from the top of the boiler house. To allow for maintenance work at boiler top level, or for off-load ventilation at points where gases accumulate, a limited number of "opening" type windows are provided.

Thus, the optimum scheme from the point of view of

comfort is one where (a) radiant heat is retarded by the application of efficient insulation material and some suitable paint; (b) relative humidity is reduced with any increase in temperature; and (c) air movement is controlled and directed to zones or points where required.

Efficiency

The provision and adoption of a scheme of ventilation which will allow the operating staff to maintain plant efficiency at maximum level is obviously desirable. The whole question of power station operating efficiency is of such importance that it is worth while maintaining the level of efficiency at the highest value consistent with the comfort of the operating personnel. A brief summary of some familiar schemes formerly used may help in the appreciation of the problem. In Fig. 2 are shown in outline four schemes of ventilation.

In these schemes there are several factors involved—some of them being inter-dependent. As previously mentioned, the greater the flow of air allowed to pass through the boiler house or turbine house, the greater the amount of heat taken from the external surfaces of the boilers, turbo-alternator sets, steam piping and auxiliaries. On the other hand, if sufficient air flow is not provided, conditions soon become extremely uncomfortable.

Example (i) shows a scheme usual in older installations where no attempt was made to provide either comfort or efficient ventilation. Here, cold air is drawn directly to the boiler fan with consequent loss of the advantage of using warm air for combustion requirements. Cases (ii) and (iii) are commonly employed. Example (ii) has the fan suction low down in the building, while in case (iii) it is arranged at the top level of the boiler house. Case (ii) has the disadvantage that during the summer season, when doors, etc., must be kept open for cooling of the boiler house, the fan-suction cannot take advantage of the heated air passing to waste through windows and other openings at the top of the boiler house. Case (iii) has this additional advantage. Windows are indiscriminately used in (i), (ii) and (iii). Case (iv) goes a step farther in that the air supply to the fans is drawn from the turbine house and from the warm air rising up through the boiler house. In this way, forced ventilation of the turbine house is achieved without excessive heat losses occurring. In addition, loss via the boiler house roof ventilators is avoided. An appreciation of the factors involved is essential for the optimum operation of this scheme, and the test figures detailed later in these notes may be helpful. Adequate ventilation of all operating zones can be achieved in temperate climates with no free exit from the boiler house or the turbine house at high level, by drawing air through both buildings to the fan suction. It is not necessary to have personnel permanently stationed at levels higher than operating floor; the high-level areas are mostly visited during normal operation for routine checking.

It is not proposed to discuss here the economics or operational advantages of taking air from boiler top level in stations where the forced-draught fans are in the basement; that aspect has already been amply covered in papers and technical articles elsewhere. Sufficient it is to say that the fans in most new stations draw air from boiler top level.

The heat given off from steam power plant can be increased or decreased by modifying the scheme of ventilation. As an indication of this, consider the schemes shown diagrammatically in (a) and (c) of Fig. 3; (a) has a heat release from turbine house and boiler house plant of 13.0×10^6 B.Th.U.s/hr., whereas case (c) has 9.80×10^6 B.Th.U.s/hr. with the same plant in use. (See test results below.)

Too often, heat balances are drawn up by assuming a value for radiation losses. In the tests carried out at average annual conditions, the nett radiation/convection losses varied by 0.43 per cent. When outside air temperature and air velocity, door and window openings, and also the number of units in service vary, the radiation loss per unit will change, and this loss should not be left simply to estimation. The calculation of this item will account in part for the mysterious manner in which unmeasured losses vary from test to test. The problem of measurement may be considerably simplified by the adoption of the scheme outlined above.

The whole problem of power station ventilation has, by some authorities, been approached from the point of view that the heat losses from the surfaces of the boiler plant of the type and size installed is 0.5 per cent. of heat input, of the turbo-alternator set 1.5 per cent. of output, and of auxiliary plant 5 per cent. of output. From these figures the sizes of louvres and openings are determined. This gives, however, a very simplified and a somewhat misleading answer.

It is somewhat alarming to consider the quantity of waste heat that is emitted unnecessarily from the roofs of power stations, and indeed from many other industrial installations.

The application of the scheme here suggested could have a considerable effect on the overall efficiency of existing stations, depending on several factors, e.g.:—(1) If hot air recirculation on the boiler air-heater is not used then raising of the air inlet temperature to the forced-draught fans will thus raise the flue-gas temperature and increase the amount of fan power required, with consequent reduction in the nett benefit. (2) If hot air recirculation is employed to maintain the air-heater metal at an economic temperature whereby corrosion is not too rapid, then by raising the F.D. fan air inlet temperature, this recirculation is reduced. The flue gas temperature remains the same and a gross gain in efficiency due to the hotter air, to the zero roof-louvre loss, and the lower fan power needed accrues.

Tests at a power station

It is relatively simple to effect a heat balance to show where the heat radiated from the items of plant in the station goes. The velocities, the temperatures, and direction of flow at each aperture are measured; the calculation of heat loss through walls, roof and floor is a standard calculation and figures are available for all normal constructional materials. The figures must be for the appropriate degree of exposure. The effect of heat from the sun during the summer months is considerable where glazed construction is extensively employed. In the station where the tests were carried out this is not a factor.

The heat loss from the surfaces of the plant can be computed either directly or indirectly; the direct measurement being achieved by measuring the surface temperature of each increment of surface and calculating the heat loss for each, the sum of these providing the

total. This method raises numerous problems. For example, the co-efficients of heat transfer and emissivities have to be chosen, the ambient air temperature at each increment of surface found, and the total area of the surfaces of all plant, including that of the interconnecting ductwork and piping determined. The indirect method is here employed, where the radiant loss is measured as the sum of (a) the heat to the F.D. fan suction; (b) the heat loss through walls, roof and flooring; and (c) the convection loss through openings at a high level. Of these three, the second presents a possibility of inaccuracy comparable with the direct method of measurement, but in this case the heat involved is a fraction of the total loss, and the possibility of error is correspondingly less. External temperatures are taken as the zero of heat gain. The indirect method is rapid, and thus lends itself to determining which of several methods of ventilation gives the smallest loss. This represents what is basically of main interest.

The station selected for these tests was chosen because various schemes of ventilation could be attempted by virtue of the large number of windows as well as adequate openings in all floors. The turbine house contains three Parsons 30-MW turbo-alternator sets, and the roof of the house is fitted with vents which can be completely closed. The usual large shutter-type door is fitted, and this proved useful in allowing for variation in the amount of air allowed into the building. The passageway leading from the turbine house to the boiler house is completely "open" along its entire length over operating floor level.

In the boiler house there are four Babcock & Wilcox type F.H. 200,000 lb./hr. boilers; the roof is fitted with conventional louvres which, for test purposes, are not very effective in aiding the chimney effect in the building, because when there is a strong wind it blows through the boiler house from one side to the other, thus greatly reducing the effective area. The louvres were, for part of the period during which the test was carried out, blanked off to simulate conditions with either shut or with no louvres. Throughout the tests, three boilers and two turbo-alternator sets were actually on load—the fourth boiler and turbo-alternator being under construction at the time. A series of tests were carried out to determine the difference in the amount of heat given off by plant and the degree of comfort attainable with variations in the scheme of ventilation. A test was also carried out to show the effect of "closing-off" all openings with the exception of the roof louvres. In this case, the temperature at operating floor level was found to be 78 deg. F.; but after a time the operating personnel complained of the lack of ventilation; conditions were clearly becoming most uncomfortable.

Results

A synopsis of a series of tests carried out when the boilers were operating at 90 per cent. load, and when the outside temperature, wind velocity and humidity were close to the annual average, is indicated in Fig. 3. The total heat given off from the various items of plant varied from 13.9×10^6 to 9.8×10^6 B.Th.U./hr., depending upon the scheme used. Conditions experienced with the roof louvres open, and with openings in the boiler house of 320-sq. ft. below and 305-sq. ft. above operating floor level, and 650-sq. ft. in the turbine house below and 175-sq. ft. above operating floor level, are indicated in Fig. 3(a). Conditions were comfortable at the various operating positions, but the total heat loss from the plant was 13.0×10^6 B.Th.U./hr., of which 7.5×10^6 B.Th.U./hr. was returned to the fan suction of the three boilers.

The optimum scheme with open roof louvres is indicated diagrammatically in Fig. 3(b). Openings of 140-sq. ft. beneath boiler house floor level were the only deliberate openings provided; normal air penetration into the turbine house maintained comfortable conditions. In this case the heat loss was assessed at 13.90×10^6 B.Th.U./hr., of which 8.31×10^6 B.Th.U./hr. returned to the fan suctions. Conditions obtaining when the roof louvres were closed are indicated in Fig. 3(c). A considerable drop in heat loss resulted, and the requisite number of openings were allowed to provide ingress of air for combustion requirements. There was no excessive amount of heat radiation from the plant. In this test, an area of 280 sq. ft. was found to be adequate, and it showed a high efficiency compatible with comfort. The heat radiated from the plant was 9.8×10^6 B.Th.U./hr. and of this 7.86×10^6 B.Th.U./hr. returned to the fan suctions. An increase of 15 deg. F. in the outside temperature caused the temperatures at boiler top level to be raised by 4 deg. F. This scheme is practicable for operation during both the summer and winter months in the particular climate concerned. In the scheme indicated in Fig. 3(d), the flow of air was measured as entering through the roof louvres to the fan suction, at the same time as hot air escaped elsewhere through these louvres. The overall loss in that case was 13.7×10^6 B.Th.U./hr. of which 9.3×10^6 B.Th.U./hr. was found to be returning to the fan suctions; conditions were well outside the comfort zone. The difference in nett heat loss from the station buildings between cases (a) and (c) was 3.60×10^6 B.Th.U./hr. which for the particular test carried out represented 0.43 per cent. of the cycle efficiency. In the station where the tests were made, hot air recirculation on the air-heaters was employed; thus the adoption of (c) resulted, in addition, in less hot air recirculation and a slightly lower requisite fan power. The losses show a higher percentage at lower loads, as the amount of heat released does not fall off in proportion to the load decrease. This gain was considerable and is one which would not be minimised through ageing of the plant in the station.

From these tests it is clear that an outdoor plant involving no ventilation problems is not as attractive as might at first sight appear. The loss of 5.5×10^6 B.Th.U./hr. would be greatly exceeded where free air circulation is allowed at the surfaces; the average wind velocity at the station in which the tests were carried out is 10 m.p.h. in winter and 8 m.p.h. in summer. No saving or advantage in using warm air at the forced-draught fan suction is possible. Even the difference between 5.5×10^6 and 1.9×10^6 B.Th.U./hr., which is but part of the saving possible by virtue of having an enclosed plant, is sufficient in itself to make the housing of such plant the more economic; the advantages which are, in the climate concerned, virtually a necessity, are thus economically available. Plant provided with a far greater amount of insulation would thus be required for economic outdoor operation and it is probable that an air-encased boiler casing would be necessary in the

climate here considered to make the proposition more economic than a completely housed plant. The economic comparison of various forms of building materials is also important. The total heat loss from the station tested was, in Fig. 3(c), for example, 1.9×10^6 B.Th.U./hr. under average annual conditions—the station being constructed with concrete walls stepping down from 22½-in. at the base, to 9-in. at the top. Had this station been glass-clad upwards from, say, 9 ft. 0 in. above operating floor level, the heat loss would have been 3.0×10^6 B.Th.U./hr. Thus, the heat loss from the building must be considered in deciding upon the material to be used in the construction of the buildings.

An efficient scheme for the ventilation of a steam power station is one which provides comfortable working conditions at all operating positions and which, at the same time, allows for the lowest heat loss from the building. Results of actual tests carried out with varying schemes of ventilation show a wide variation in heat radiation or emission from plant, depending, of course, on the particular scheme used.

In conclusion, the author expresses his indebtedness to the Eire Electricity Supply Board for permission to publish this article, and to those members of the staff who assisted in carrying out the actual tests.

References

"*Heating and Ventilation in Factories*," H.M.S.O., 1952.
"*Kempe's Engineering Handbook*," Vol. 2.
"*Some Notes on the Routine Determination of Boiler Heat Balances*," G. Doxey, *Journal Inst.F.*, Jan., 1956.
"*Testing of Boilers and Turbo-Alternators in Power Stations of the Central Electricity Authority*," H. S. Horsman, *Proceedings, I.Mech.E.*, 1956, No. 18.

A Curtain-type Grit and Dust Arrestor

ALTHOUGH new to Great Britain, the "DEP" dust control equipment now being manufactured and supplied by W. G. Allen & Sons (Tipton) Ltd. (British Patent No. 699,760) is well known in many European countries, particularly in Belgium where it has been established for a number of years, and where both large and small installations are reported to have operated successfully in many different industries.

The equipment now available in this country is known as the "ALLEN-DEP" curtain-type dust and grit arrestor, in which the filtering medium comprises a number of grids, placed one behind the other in staggered formation to form a single curtain, or banks of curtains. Each grid consists of a row of profiles placed side by side at equal distances; the shape, size and number of profiles being carefully calculated for each individual application. The complete curtains are always located vertically in the unit, with their concave sides facing the inlet air stream as indicated in Fig. 1.

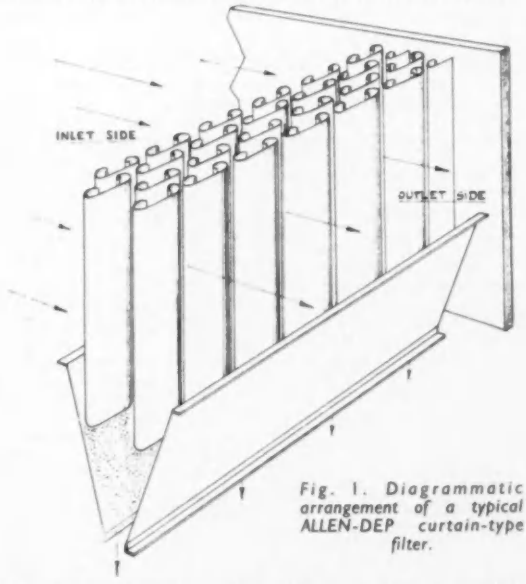


Fig. 1. Diagrammatic arrangement of a typical ALLEN-DEP curtain-type filter.

Construction

The profiles are assembled by welding to crossbars or stiffeners, the thickness of which controls the spacing of the different rows or grids. The grids thus formed are easy to handle, and are suspended freely from the top of the unit casing. A manual or mechanically-operated shaking mechanism fitted to the base of the curtains precipitates the dust, although the profiles themselves are designed to produce a recuperation effect upon the dislodged particles.

The casing, which is provided with flanged inlet and outlet directional flow manifolds, is normally manufactured from sheet steel, and where high temperatures are involved is suitably insulated. Adequate access doors for dust removal, maintenance and inspection are provided.

Profiles can be fabricated from a variety of materials to suit specific requirements, including mild steel, stainless steel, lead coated steel, bronze, cast iron, aluminium, porcelain or plastic.

Principle of operation

As the dust laden air approaches the first grid or row of profiles, a proportion of the dust particles rebound laterally, and are collected in the lateral semi-tubular conduits formed at each end of the profiles, and pass downwards out of the air flow. The air is then forced in thin streams through the spaced profiles to the next staggered grid with an increased velocity followed by expansion, and as the air streams expand and flow laterally around the profiles and through each grid in turn, the dust particles are submitted, for short periods, to a centrifugal effect which complements the inertial effect.

As will be appreciated, the total volume of air flowing through the filter is subjected to a large number of directional changes, and therefore the dust particles are in turn submitted to velocity increase, followed by fluid expansion, a fact which, the manufacturers claim, contributes to an increase in the dust content of the outer layer of each of the many separate air streams, and facilitates the dust recovery in each grid.

The "ALLEN-DEP" equipment will deal with high and low dust loadings; varying flow conditions; high, low or varying temperatures; and with either large or

micronic dust particles. Efficiency of collection for a given dust will naturally depend upon the type, size and number of profiles incorporated, and upon the face velocity; but with experience of many industrial dusts the company claim that efficiencies of well over 80 per cent. have been achieved. In addition, the equipment has been designed to make it a simple matter to insert extra curtains, should this be found necessary, while for certain applications the operating efficiency may be further increased by a periodic circulation of light-oil, or water-flushing of the curtains. This provides an adhesive surface, while at the same time maintaining the characteristics of simplicity and low back-pressure experienced with the dry-type curtain. Probably the most important characteristic common to all "ALLEN DEP" units is the low back-pressure—approximately $\frac{1}{8}$-in. w.g.—which means that the equipment will in many instances operate under natural-draught conditions.

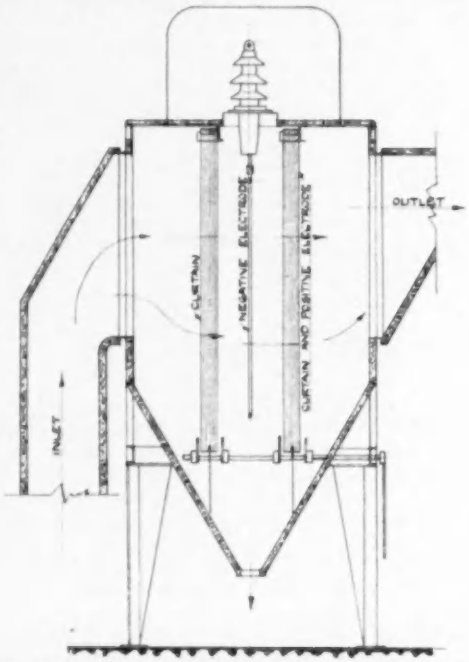


Fig. 2. Diagrammatic arrangement of a double curtain with electrostatic precipitation.

A further development of this equipment is the combination "ALLEN-DEP" curtain with electrostatic precipitation, so arranged that the rear curtain, as shown in Fig. 2, constitutes the precipitation or positive electrode, while the first curtain acts as a pre-filter to the high-tension negative electrode, by removing the bulk of the large dust and grit particles. An advantage of this arrangement is that the unit would still operate as a static filter if the electrical power should be switched off or fail for any reason. The company state they would normally recommend this system in conjunction with pulverised-fuel-fired boiler plants, or for other installations where an extremely high extraction efficiency was required. They also point out that, in certain industrial installations, it would be possible for the combination equipment to be installed in two stages—first the static section which includes the casing, screens, hopper and access doors, etc., and later the electrical section.

C.E.G.B. CONTRACTS

During the past two months, the Central Electricity Generating Board have placed contracts for boiler plant, generating plant, transmission lines and transformer equipment, etc., amounting, in the aggregate, to more than £14 million. Two 120-MW reheat boilers for Richborough power station have been ordered from John Thompson Water Tube Boilers Limited. Boiler feed pumps and booster pumps for Blyth "B" power station, and penstocks for Ffestiniog power station have been ordered from Sulzer Bros. (London) Ltd. The contract for cooling tower No. 3 for Rugeley has been placed with J. L. Keir & Co. (London) Ltd., and four 3.8 million gal./hr. natural-draught cooling towers for Skelton Grange "B" power station have been ordered from Mitchell Construction Co. Ltd. For Thorpe Marsh power station, two 90-ton overhead electric travelling cranes have been ordered from Babcock & Wilcox Limited, and booster pumps, starting and standby boiler-feed pumps from G. & J. Weir Limited. A contract for preliminary construction work at Thorpe Marsh has been placed with Mitchell Construction Co. Ltd.

A useful booklet, giving abbreviations of the names or titles of associations, institutions, research and trade associations, and which was first published in 1957, has been reprinted in an enlarged and revised form, and published recently by the British Electrical & Allied Manufacturers' Association (BEAMA Publication No. 159). The booklet is primarily for members of BEAMA, but copies are also available to any other interested organisation or individuals. In selecting abbreviations to be included in the book from the many thousands which are in constant use, the choice was based on those which are likely to be met by those in the electrical and allied industry. Copies of the 16-page booklet are available from the BEAMA, 36, Kingsway, London, W.C.2; single copies 1s. 6d.; 20 for £1; 100 for £4. All prices include postage.

PROPOSED SITE FOR NUCLEAR POWER STATION

The Central Electricity Generating Board are to make application to the Minister of Power and to the Local Planning Authority for consent to develop a site of about 175 acres at Oldbury-on-Severn for a nuclear power station. The site lies on the south-eastern bank of the Severn Estuary, 14 miles north of Bristol, and four and a half miles down-stream of Berkeley where one of the Board's first two nuclear power stations is under construction. Advantage will be taken of a rock shelf off-shore to create an artificial tidal reservoir from which the large quantities of water required for cooling the condensers of the steam turbines can be drawn during low tide periods. This unusual arrangement will reduce the costs that would normally be incurred in obtaining cooling water from an estuary with as wide a tidal range as the Severn. Foundation conditions on shore are good for supporting heavy reactors. Present indications are that a station on this site might have a total output of about 1,000-MW, and be connected to the 275 kV Supergrid. Investigation of three other areas on the Severn Estuary is continuing to determine whether they are suitable for future nuclear power station development. These are at Tidenham, Aust and Portskewett. Three nuclear power stations are now under construction by the Central Electricity Generating Board at Berkeley, Gloucestershire (275-MW), Bradwell, Essex (300-MW) and Hinkley Point, Somerset (500-MW). Preliminary works have been started for the construction of a fourth station at Trawsfynydd, Merionethshire (500-MW), and applications have been made for consent to establish stations at Dungeness in Kent and Sizewell in Suffolk.

Mr. J. S. Brough has joined Humphreys and Glasgow, Ltd., of London, from Monsanto Chemicals, Ltd., where he was general manager of production. As technical director and general manager, he will act as deputy to **Mr. G. G. Farthing,** deputy-chairman and managing director of Humphreys and Glasgow.

POWER PLANT ENGINEERING during 1958

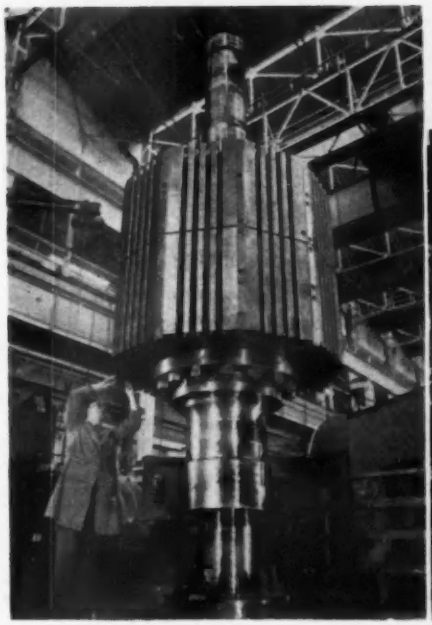
IN recent issues of this journal we have published accounts of the activities during 1958 of some of the manufacturers of power generating plant and associated equipment. We now include notes concerning the activities of some of the other manufacturers.

A.E.I. Heavy Plant Division—
BRITISH THOMSON-HOUSTON CO. LTD.

In previous years we have had the opportunity of dealing with The British Thomson-Houston Co. Ltd. activities in the heavy power plant field on a separate basis. This year, however, the position is somewhat different as 1958 saw the formation of the A.E.I. Heavy Plant Division and the A.E.I. Turbine-Generator Division—the first stage in the complete integration of the separate, but parallel design, manufacturing, and commercial organisations within the constituent companies of Associated Electrical Industries Limited. The formation of the two divisions was referred to in the May, 1958, issue of this journal. The Heavy Plant Division has its headquarters at the B.T.H. centre, Rugby, and is responsible for the manufacture of large electrical machines for hydro-electric, mine winding, rolling mill and general heavy industrial applications; centrifugal compressors, blowers, exhausters and boosters; gears and gearing; diesel-electric and turbo-electric marine propulsion; marine auxiliaries; and power rectifiers of all types. The Turbine-Generator Division, with headquarters at the Trafford Park, Manchester, works of Metropolitan-Vickers, is responsible for steam and gas turbines, turbo-type generators, turbo-type synchronous condensers, axial-flow compressors, heat-exchange plant of all types, and geared-turbine marine propulsion machinery.

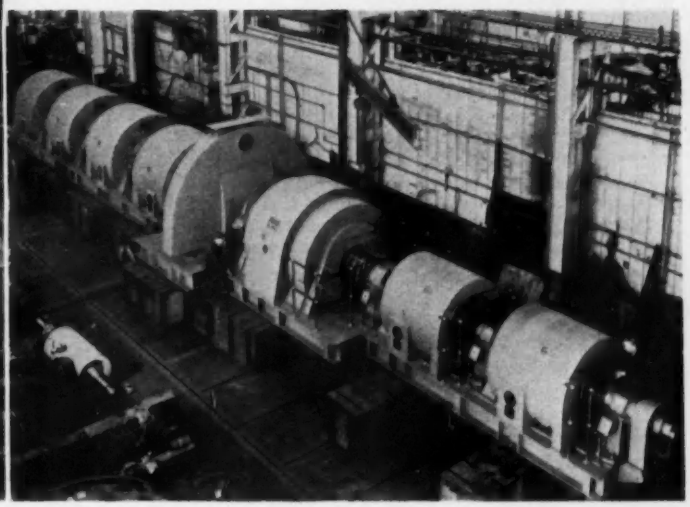
Orders have been received during the year by the Heavy Plant Division for generators to be installed at a number of hydro-electric stations, while an important development in this field, from the design aspect, has been the programming of waterwheel generator designs for their solution by a computer installed at the Rugby Works. This computer is also widely used on design problems other than in connection with hydro-electric projects, but in this field it has proved particularly valuable.

Work is proceeding on the manufacture of the second four 44,444-kVA vertical generators for Roxburgh power station, New Zealand, and also on the three 88,000-kVA vertical generators for Belesar power station in Spain. Satisfactory progress is also being maintained on four 78,900-kVA machines ordered by the Central Electricity Generating Board for the Ffestiniog pumped-storage scheme. During the course of the year the seventh 16,700-kVA waterwheel alternator was commissioned for the Uganda Electric Board at Owen Falls power station, and the component parts for the eighth set are on site awaiting erection. Recently, a 32-MVA, 11-kV, 600 r.p.m. generator, one of two for the Eume power station in Spain, was tested at Rugby.



(Left). Rotor for a 32-MVA 11 kV waterwheel-alternator during erection at the B.T.H. Rugby Works. Two of these alternators are being supplied for Eume Power Station, Spain.

(Below). A flywheel motor-generator set for a twin-drive reversing blooming mill at Durgapur Steelworks, India, shown during erection at Rugby Works.



During the year orders for large motors for general applications were received from both the home and export markets. For the Chesterfield Tube Co. Ltd., two 600-h.p., type-AMT, synchronous induction motors were put in hand for driving hydraulic pumps. Daniel Adamson and Co. Ltd. ordered three, type-AGT, synchronous motors, each rated at 1,330-h.p., 1,500 r.p.m., suitable for driving centrifugal compressors for the National Coal Board's Wolstanton Colliery. Both of these were repeat orders. From Canada an order was received for three 450-h.p., type-AKT, synchronous motors for driving reciprocating compressors. For service in South African gold mines, orders were received for five 1,010-h.p., 750-r.p.m. synchronous induction motors for driving ventilation fans, and for four 1,600-h.p. synchronous motors for driving pumps. For the new Buenos Aires power station, British Thomson-Houston-International Combustion, Partnership Limited ordered 48 large motors for driving auxiliaries. Twenty of these are for boiler-feed and booster pumps rated at 3,000-h.p., 2,980-r.p.m., and 950-h.p., 1,480-r.p.m. respectively. Sixteen are for river intake and circulating-water pumps rated at 850-h.p., 297-r.p.m., and 490-h.p., 360-r.p.m. respectively. Ten are two-speed induction motors rated 800/450-h.p., 740/590-r.p.m. for boiler induced-draught fans, and two are type-AKT synchronous motors rated at 1,660-h.p., 333-r.p.m. for driving compressors for sootblowing air supplies.

Good progress was made with installation of equipment. At the I.C.I. Wilton polythene plant the erection of eight type MPC 1,100/550-h.p., 172/86-r.p.m. variable-speed drives for secondary compressors is nearing completion. At the N.C.B. Hem Heath Colliery, the fourth 1,330-h.p. motor driving a Daniel Adamson compressor was put into service. Four 1,200-h.p. and two 800-h.p., type AMT, synchronous induction motors were completed for Associated Portland Cement Manufacturers Ltd., for driving cement-grinding mills. For this customer also, the second 800-h.p. double-reduction 750/20.5-r.p.m. gearbox is nearing completion.

Early in 1958 two orders were received from Northern Aluminium Company for equipment to be installed at their Rogerstone Works. The first was for the drive of a 144-in. reversing plate mill and comprises two 4,000-h.p., 30/60-r.p.m. motors, forming a "twin-drive" supplied from a flywheel motor generator set with an 8,000-h.p. induction motor, a 35-ton flywheel and four 1,600-kW d.c. generators. This, in terms of torque capacity, is larger than any other reversing mill-drive in this country, and will be the first twin-drive having the "top forward" arrangement—in which the top-roll motor is the nearer to the mill—to be installed in the United Kingdom.

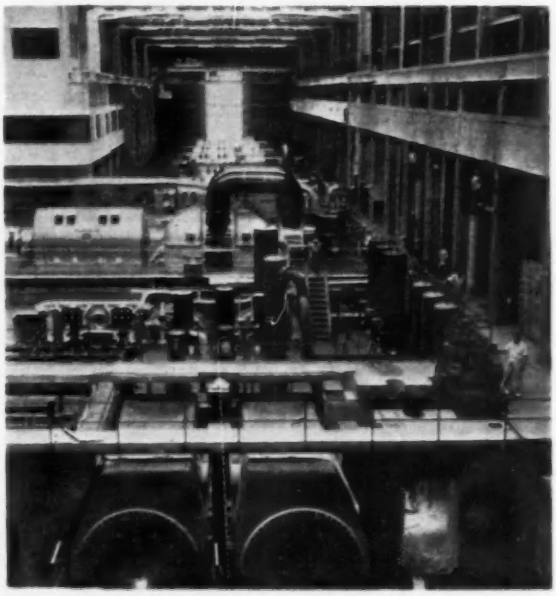
Further orders received were from Guest Keen & Nettlefolds (South Wales) Limited, involving a 300-h.p., 300/1,008-r.p.m. d.c. motor, and some special control gear for extensions to their Tremorfa rod mill, and from John Summers for a 750-kW generator for a skin pass mill.

The large 'twin-drive' reversing blooming mill equipment for the new Government of India steelworks at Durgapur is nearing completion in the Rugby works. This equipment comprises two 3,000-h.p., 40/80-r.p.m. reversing d.c. motors, a flywheel motor-generator set, and all the auxiliary drive motors and control gear. The flywheel motor-generator set and a large section of the control equipment have already been despatched, and the remainder of the equipment is in the last stages of manufacture.

A number of important rolling mill equipments were placed in commission during the year. In Australia a drive for a new steel mill was installed at the latter end of 1957. This drive comprises 14 d.c. motors ranging from 250 to 1,000-h.p., supplied from two banks of mercury-arc rectifiers each rated at 3,500-kW, 600-V.

A.E.I. Turbine-Generator Division—
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

The A.E.I. Turbine-Generator Division formed during the year embodies, in combination, the relevant commercial and design staffs and the power plant manufacturing facilities of the British Thomson-Houston Co. Ltd. and Metropolitan-Vickers Electrical Co. Ltd., with a single specialised executive body in direct control. Within the Turbine-Generator Division there is now a single design policy superimposed on the vast common background of engineering experience. On the manufacturing side, there are the facilities at Rugby, the extended and re-equipped workshops at Trafford Park, and the new turbine-generator factory at Larne; there is also Germiston Works, which specialises in the manufacture of condensing plant and heat-exchange equipment.



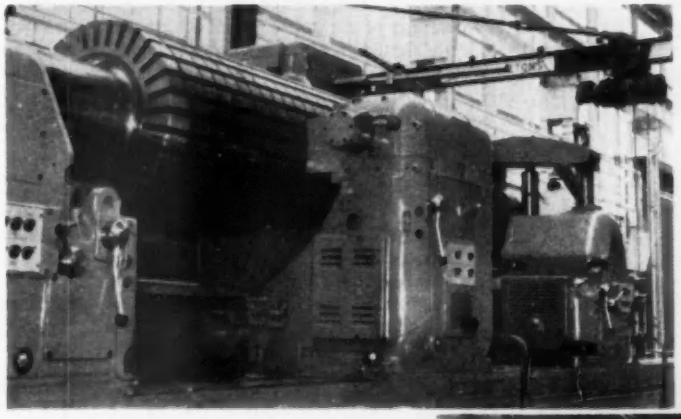
Turbine house at Hok-Un power station Hong Kong where there are one 12.5-MW, one 30-MW and four 20-MW Metropolitan-Vickers sets. In foreground, preparation is in hand for a further M-V set of 30-MW capacity.

During the year, 30 steam turbine-generator units made by the company, and having an aggregate capacity of 987.01-MW, were commissioned in power stations at home and overseas. In Great Britain, seven machines were commissioned in stations of the C.E.G.B.—the first of four 120-MW reheat units at Blyth "A" station; the fifth 100-MW machine at Castle Donington; the second 60-MW unit at South Denes; the fifth 60-MW unit

at Portishead " B " (rated by the C.E.G.B. at 65-MW); the fourth 30-MW unit at Bold " A "; the sixth 30-MW at Goldington; and a 20-MW unit at Hayle.

Castle Donington power station, with a thermal efficiency (based on units sent out) of 32.16 per cent., was the most efficient C.E.G.B. station for the 12 months ending March 31st, 1958. Of the 20 most efficient C.E.G.B. stations, seven were equipped with turbine-generator units designed and manufactured by what is now the A.E.I. Turbine-Generator Division; viz., those for Castle Donington, Littlebrook 'B,' Portishead 'B,' Meaford 'B,' Battersea 'B,' Plymouth 'B,' and Barking 'C.' The Castle Donington performance is the best so far achieved by any British power station.

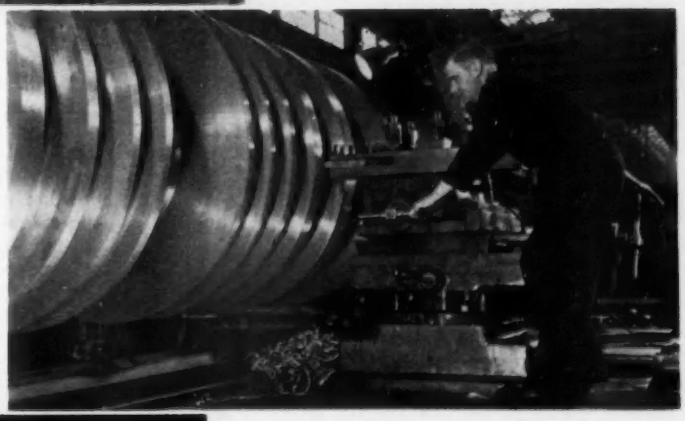
Overseas, 23 sets with an aggregate capacity of 567.01-MW were commissioned in power stations for public supply. A 66-MW machine at Wabamun, and two 33-MW, 60 c/s machines at Brandon were put into service in Canada. A 60-MW unit was commissioned at High Veld, South Africa, 30-MW units were commissioned at Salisbury (Rhodesia), Malaga and Almeria (Spain), Hok Un (Hong Kong), Mercer (New Zealand), Wallerawang (New South Wales), and at Chamoun station at Beirut in the Lebanon. The sixth 25-MW unit was put into service at Pasir Panjang station, Singapore. A 15-MW unit was commissioned at Mallorca for I.N.I. Spain, and another, in India, for the Ahmedabad Electricity Co. A 12-MW set was put into service at Malim Nawar, Malaya, and 10-MW units were commissioned at Ywama and Ahlone stations in Burma.



(Above). Cutting the generator rotor winding and ventilating slots on a Heller slot-milling machine at A.E.I. Larne Works.

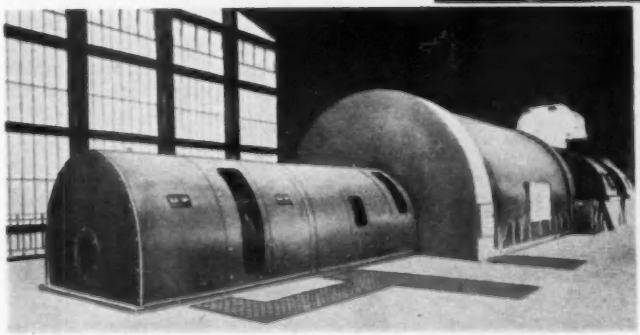
These overseas commissionings include a 6.51-MW turbo-generator at the Wairakei 'A' geothermal station in New Zealand. The Wairakei 'A' installation comprises high-pressure turbines rated at 6.51-MW, intermediate-pressure turbines rated at 11.148-MW, and double-flow low-pressure turbines rated at 11.175-MW; initial steam pressures are 180 lb./sq. in. and 0.9 lb./sq. in. respectively. The turbine-generator sets normally operate in series, but arrangements are made to permit various combinations of units.

Among machines completed during the year for shipment to site are the sixth 100-MW set for Castle Donington, and the sixth 60-MW set for Portishead 'B,' which



(Right). Machining the low-pressure rotor of a turbine for Berkeley nuclear power station.

(Below). The first of four 120-MW sets of Metropolitan-Vickers design being supplied to Blyth 'A' power station by A.E.I. Turbine-Generator Division, Trafford Park.



when erected on site will complete the installations at these two stations. Also completed during the year were the second 60-MW unit for Elland, and the second 120-MW generator for Blyth 'A.' The Blyth generators, which have direct-cooled rotors and conventional stators, will operate with a hydrogen pressure of 30 lb./sq. in.

Machines completed and shipped overseas during the year include the second 66-MW unit for Wabamun station (Canada), a second 30-MW machine for Mercer (New Zealand), a 20-MW low-pressure unit to operate in conjunction with the high-pressure back-pressure

units at Morwell (Australia) and a 12-MW unit for the Malim Nawar station in Malaya. A 60-MW unit, similar in many respects to the C.E.G.B. units at Portishead, was shipped to the High Veld station in South Africa. This machine is one of the first hydrogen-cooled units to be installed in South Africa; it operates at 11-kV, 0.8 p.f., and with a hydrogen pressure of 15 lb./sq. in.

In the field of nuclear power generation, construction work is proceeding on four 83-MW turbo-generator units with condensing plant and auxiliaries for Berkeley power station; sixteen 4,000-h.p. carbon-dioxide gas-circulators for the same station are in the course of manufacture.

In 1958, the two companies now forming A.E.I. Turbine-Generator Division received contracts for eight major turbo-generator units for power stations overseas. Five 120-MW reheat turbines with hydrogen-cooled generators are to be installed in a new power station at Buenos Aires, Argentina; responsibility for the complete station being in the hands of a partnership formed between the B.T.-H. Export Company and International Combustion (Export) Limited. Two 120-MW reheat units with steam conditions of 1,800 lb./sq. in. and 1,000 deg. F., with reheat to 1,000 deg. F., will be manufactured for Elektrim, Poland. An order was also received from Fuerzas Electricas de Cataluna for Mata generating station, a complete new power station near Barcelona, Spain. Mata station will house a 60-MW, 3,000 r.p.m. turbine-generator unit; the 50 c/s, 11.8-kV generator will be hydrogen-cooled at 30 lb./sq. in., and will have a maximum rating of 75-MVA.

A Metropolitan-Vickers 6.5-MW set installed at the Kynock Works, Witton of I.C.I. Ltd., Metals Division.

One other major order of particular interest is the contract received by the company for Gach Saran power station, which will house three 4-MW gas turbo-generator sets. Metropolitan-Vickers Electrical Co. Ltd. is main contractor for the complete station, and for some 40 miles of transmission lines. The station will provide power for the development of the Gach Saran oilfields by the Iranian Oil Producing and Exploration Company.

Power station auxiliaries

Contracts received for the supply of power station auxiliary plant and equipment include an order from G. & J. Weir Limited, covering the supply of six 770-h.p., type-TAS, and twelve 2,350-h.p., type-HTAS, squirrel-cage motors with twin cooling-air circuit features required for pump drives at the Aberthaw power station, South Wales. Type HTAS motors, which conform to the latest design of boiler feed-pump drives, are already installed at Hams Hall, South Denes and North Wilford power stations of the C.E.G.B.

Overseas business includes contracts from Babcock & Wilcox Ltd. for boiler and fan auxiliary motors for the Tacoa power station, Venezuela, and Yallourn power station, Victoria, Australia. A contract has been received from A.E.I. (Pty.) Limited, Melbourne, for Riley Dodds, comprising ten 400-h.p., type-RA, squirrel-cage motors, required for driving new forced-draught fans at the Port Augusta power station, South Australia.

A filter-ventilated motor (HTAS 168132), rated 3,000-h.p. at 3,560-r.p.m. for use on a 4,160-V three-phase 60 c/s supply, is the first of six motors for driving boiler feedpumps in a new generating station in Canada. Each motor is equipped with two pedestal-mounted sleeve bearings of the self-contained, self-lubricated type specially-designed for operating at 3,600-r.p.m., and there are no wearing parts other than the bearing bushes; these machines are quiet-running and very efficiently cooled.

Industrial plant

Industrial generating plant referred to in the following notes includes that supplied during the year both by Metropolitan-Vickers and B.T.-H., and now covered by the newly-formed A.E.I. Turbine-Generator Division. Fifteen M-V and B.T.-H. turbo-generator units with an aggregate installed capacity of 101.96-MW were commissioned for industries in Great Britain during 1958. Four of these machines, with an aggregate capacity of 68.8-MW, were installed in power stations of Imperial Chemical Industries Limited—at Wilton, Thornton, and West Bank respectively. A 10-MW set was commissioned for Bairds and Scottish Steel Limited, and a 4.65-MW set for John Summers Limited. Two 4.52-MW back-pressure primary turbines and two 2.5-MW extraction back-pressure secondary turbines were commissioned at the Merseyside power station, Port Sunlight, of Unilever Ltd. Three units aggregating 3.25-MW were commissioned overseas, two for the sugar industry, and one for an asbestos mine.

Among turbo-generator orders completed for shipment were a 10-MW machine for Tugela Paper Mill, South Africa (a duplicate of the two-cylinder double-extraction unit already in service); a 750-kW back-pressure unit for the Grays Inn Sugar Co. (Jamaica); and a 1,500-kW back-pressure unit for the Indian Aluminium Company. Two machines, one of 10-MW and the other of 12.5-MW capacity, were completed for shipment to steelworks in Great Britain, and a 7.5-MW double-extraction unit was completed for St. Anne's Board Mill, Bristol. The 4.5-MW gas turbine-generator unit for the Shell Co., to be installed at Seria (British North Borneo), was also completed during the year.

Orders received from industrial undertakings in Great Britain covered seven machines, ranging in output from 500-kW to 27.2-MW. The larger machines in this group were a 27.2-MW back-pressure turbo-generator unit for I.C.I. Wilton, and a 12.9-MW back-pressure

turbo-generator unit for the Ford Motor Company, Dagenham. An order was received from the West Midlands Gas Board for a 700-kW unit, and two 1,034-kW and two 500-kW units were ordered by the British Transport Commission for installation at Derby.

Orders were received from industrial undertakings overseas for four turbo-generator units. One from A.E.I. (India), for Shree Gopal Paper Mills, was for a 6.25-MW double-extraction turbine driving a 7,812-kVA generator. Smaller geared turbo-generator units of 1.5-MW and 1.3-MW respectively were ordered by the Mhlume (Swaziland) Sugar Company, and by Acme Timber Industries for installation at a new timber works at Sabie in the East Transvaal. For India, a 940-kW unit was ordered by The Mirrless Watson Co. Ltd.

Apart from turbo-generator plant, one industrial turbine application of interest was the commissioning of a single-cylinder back-pressure turbine of 2,180-b.h.p. maximum rating, which is direct-coupled to a gas compressor at the Fawley refinery of Esso Petroleum Company.

GENERAL ELECTRIC CO. LTD.

The focal point in the year's activities by this company has been the development and active project work on large reheat turbo-alternators. This includes further examination of super-critical-pressure steam-cycles. For the first time, consideration is being given to steam turbo-alternator ratings of 200-MW in territories other than Britain and the North American continent. Particular development is anticipated in Australia where two stations both with 200-MW sets are being planned, suitable for steam pressure of 2,300 lb./sq. in. at 1,050 deg. F., and with reheating to 1,000 deg. F.

At home, the last two sets (Nos. 5 & 6) for the C.E.G.B. Northfleet station have been put in hand during the year so that when completed, the station will have six G.E.C. 120-MW reheat machines.

Amongst the orders received from overseas is one from Australia for a 30-MW set forming part of a comprehensive contract for Mount Isa Mines. New Zealand is the source of an interesting order for a 10-MW back-pressure set designed to operate from a geothermal steam source. This is for the Tasman Pulp & Paper Company.

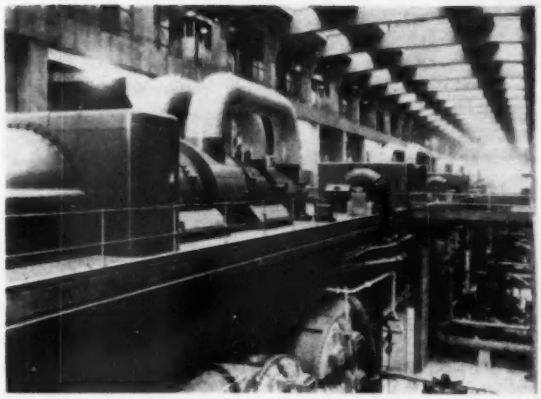
Plant commissioned during the year included four 60-MW sets for the C.E.G.B. The commissioning of one of these sets marked the completion of the Hams Hall 'C' station where six 60-MW machines are now installed. Another machine was the first of three at Bold 'B,' and the other two completed extensions at Poole. These two latter sets are of the company's latest design for 60-MW rating, the rotor conductors being cooled by direct contact with the hydrogen, while the core and stator windings are ventilated in the conventional way.

Overseas, the third 30-MW turbo-generator for Kelvin 'A' power station, South Africa, was commissioned, and the fourth and fifth machines are in course of erection on site; the sixth machine is being erected for works test prior to despatch. Two 60-MW sets for the "B" station are in various stages of manufacture.

Industrial equipment commissioned overseas during the year included three turbine-driven pumps for Sydney Water Board, and in the industrial field at home, a 6,000-kW pass-out turbo-alternator was installed for New Merton Board Mills, and a 5-MW air expansion turbo-alternator for aeronautical research. Ten steam turbo-alternator sets of various sizes with an aggregate output of 3,270-kW have been supplied for marine auxiliary services.

(Right). Extensions at Poole power station showing (in foreground) the G.E.C. 60-MW set on which alternator stability tests were carried out.

(Below). The completed turbine house at Hams Hall 'C' power station now includes six G.E.C. 60-MW turbo-alternator sets.



Centrifugal compressors

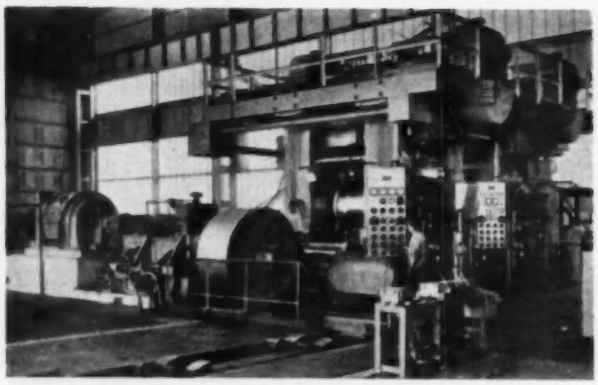
Six compressors and blowers for various requirements were ordered from the company during the year, one being of special interest. It is for a motor-driven compressor delivering air at 300 lb./sq. in., for a wind tunnel at Ottawa and was ordered by the Defence Construction (1951) Ltd. for the National Aeronautical Establishment of Canada. The 11,250 h.p. synchronous motor runs at 1,200 r.p.m. and drives the l.p. and h.p. compressors in tandem through epicyclic gears at 4,500 r.p.m. and 10,000 r.p.m. respectively.

Machines installed during the year included a turbine-driven compressor with an output of 25,700 c.f.m., at 67.5 lb./sq. in. for service at an oil refinery.

Development work

Emphasis has been placed on the development of designs for large turbo-alternators, and particular attention has been paid to the satisfactory development of the very long turbine blades required for the exhaust flow in machines of large ratings in the range 200 to 600-MW. The design of such blades of 32-in. length and 92-in. mean dia. has been completed. The blading in its vortex form, riveted root fixing, and with continuous shrouding at the tips, follows the same technique as the well-established G.E.C. practice. No lacing wires are used and the method of fixing permits individual blades and shrouding segments to be replaced if accidentally damaged.

During the year, the 27-in. blades, which are of similar geometric pattern to the new development (and as adopted on G.E.C. 120-MW reheat machines), have been in production and tests have confirmed the calculated vibrational characteristics.



Two-stand temper mill at the Port Kembla Works of the Australian Iron and Steel Co. Ltd. for which the G.E.C. supplied the main and auxiliary drives.

On-load testing

The safet protection of turbo-alternator plant is a subject on which more attention has been focused with the increased ratings now being adopted. Particular atttention has been given to reheat machines where adequate measures must be taken to avoid overspeeding in the event of the generator accidentally shedding full load. The expansion of the steam in the piping and cylinders of the set in such an event would be capable of accelerating the machine to an objectionable overspeed within a second should the valves not operate correctly. The response of the governing system on such valves is of great importance. Such governing arrangements invariably employ two lines of protection so that if any one valve fails, the safety of the machine and personnel is not jeopardised.

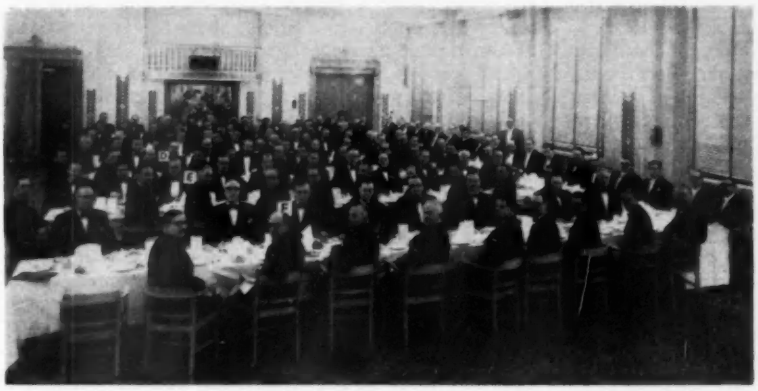
Although all large G.E.C. machines are suited for operation on a shift-load basis, it is natural that machines of this efficiency will be operated as base-load sets and at full load for very extended periods. This means that the valves are fully-open and not exercised, and a sudden emergency may find one or more of the valves inoperative after a long period of operation in extremely onerous conditions with temperatures of over 1,000 deg. F. It is to cover this possibility that attention has been paid to the development of on-load test gear. This provides a foolproof method of testing each device individually while the turbine continues to operate on-load; moreoever, it does not in any way prejudice the safety of the set should an emergency arise while actually conducting a proof test.

The equipment tested by these means on a typical large reheat turbine would be the two individual overspeed trip bolts, two h.p. steam emergency valves, four h.p. steam governing valves, two reheat interceptor valves and two reheat emergency stop valves. Each of these items is arranged so that it can be exercised at will, one at a time, thus proving its correct functioning and freedom to operate. The testing is accomplished in a fully interlocked sequence of operations.

Institution of Plant Engineers

THE seventh annual dinner of The Institution of Plant Engineers was held at the Connaught Rooms, London, on February 20th. The principal guest speakers were:—Sir John Hacking, M.I.E.E., formerly deputy-chairman (Operations) of the British Electricity Authority, and now a consultant with Messrs. Merz and McLellan; and Mr. Jack E. Duckham, F.Inst.Pet., chairman of Alexander Duckham and Co. Ltd. Proposing the toast to the Institution, *Sir John Hacking* began by complimenting it on the change in title to "The Institution of Plant Engineers," and the richly merited recognition that this implied. He hoped and believed that this change would provide the stimulus for a rapid increase in membership. He had been impressed, he said, by the wide range of subjects covered at general meetings and at those of the 18 branches. It was unfortunate that only a small proportion of these papers could be published in the Institution's Journal and he suggested that members should note those which interested them and ask if copies were available. Sir John predicted that the responsibilities of members would increase very rapidly in the near future with the approach of automation. This should lead to a great increase in membership of the Institution, because these machines, with their greater complexity, obviously require more skill from the people who are responsible for their installation and for their maintenance to keep them in satisfactory condition. Thus, that is a sphere in which members of the Institution will have to play an increasing part. Sir John concluded by paying tribute to the work that the president, Mr. K. S. London, had done for the Institution, and by congratulating him on his election that day as a Fellow of the Institution. In his response, Mr. K. S. London, B.Sc.(Eng.), M.I.Mech.E., explained that the main purpose of the Institution was to help the plant engineer. The field of plant engineering is broad and does not recognise any rigid demarcation between the various forms of engineering; in fact the plant

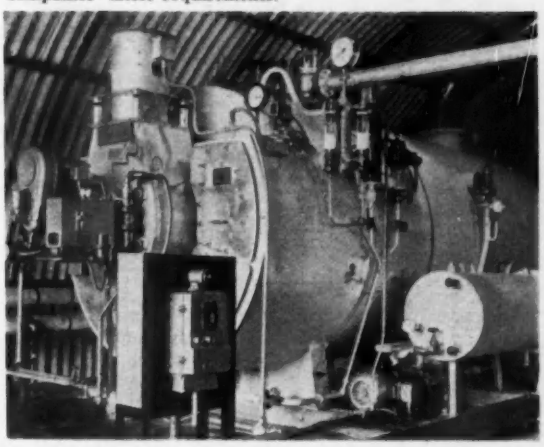
engineer is often required to embrace not only civil, mechanical and electrical engineering, but other forms as well. In short, said Mr. London, the Institution specialises in the field of non-specialisation. After stressing the importance to the engineer of cost-consciousness and the ability to express himself clearly, Mr. London continued: "It is fundamental to our thinking that membership of this Institution should be open to all *professional* plant engineers, irrespective of how they became such—whether by academic qualification and professional experience or by that longer, harder road of professional experience alone. To exclude men in this second category would not only be unfair to them but would harm the Institution. The lessons to be learnt from their experience can be invaluable to their fellow members, and they can bring to the conduct of our affairs those qualities of mind and character without which they could not have equality with men whose careers began in more advantageous circumstances. Mr. London said he believed that an overwhelming majority of the members would endorse this view; but clearly in accepting it we place ourselves at a disadvantage in our efforts to secure recognition for our qualification from employers and others. In particular we are at a disadvantage compared with those institutions who virtually limit corporate membership to applicants who have passed their own or suitable exempting examinations. "That disadvantage can be overcome if the professional conduct of each member is such that it is impossible to doubt that our standards are exacting. If we can be sure of this we shall everywhere secure the recognition we seek." Mr. London then referred to the ever-increasing importance and complexity of the engineering function in industry which made it of the utmost consequence that the outlook of engineers should be broadened and everything possible done to keep them abreast of modern practice and techniques. The Institution's contribution had been its comprehensive refresher courses for senior works and plant engineers which in the nine years of their existence had enjoyed a unique success. The president paid tribute to the work of the Institution's honorary officers and concluded by explaining the significance of the change in title of which all members could feel justly proud. The toast to the guests was proposed by *Mr. D. Lacy-Hulbert*, J.P., B.Sc., F.R.I.C., M.Inst.F., a past president, who explained that there was unfortunately a large number of absences due to influenza. In paying tribute to individual guests, he mentioned particularly Mr. Jack Duckham who nine years previously had instituted the Alexander Duckham Memorial Awards given annually to the corporate members submitting the best papers on plant engineering subjects. The response was by *Mr. Jack E. Duckham*, who said: "I pay tribute on behalf of the guests to this virile institution, to its growth and to all the inspiration which has gone behind it and which lies behind it today, as is so well evidenced by the president himself. The Institution seems to me to have grown in a matter of 12 years from boyhood right through to manhood." After referring to his pleasure in finding a number of Alexander Duckham Memorial Award winners at the dinner, he concluded by wishing the Institution every success in continued achievement in the future.



Assembly at the annual dinner of The Institution of Plant Engineers in London, on February 20th, 1959.

A NEW PACKAGED BOILER

Farrar Boilerworks Limited, Newark, Notts., have recently introduced a new type of horizontal packaged boiler, designed to burn either fuel-oil or gas, and for which they claim a thermal efficiency of approximately 80 per cent., depending on the size of unit. Known as the "Farrapac," the boiler is of the triple-pass type, and units are available with capacities of from 4,000 to 11,000 lb./hr. If used as hot water units, outputs range from 4-million to 11-million B.Th.U./hr. The flue outlet connection is located at the rear of the boiler, and the boiler tubes are arranged and proportioned to ensure a high rate of heat transfer. The burner provided is of the rotary-cup atomising pattern, capable of burning the heavier grades of oil. It is fully-automatic and gives a variable or modulated flame over a wide range of steaming loads. The new boiler has, the company state, been designed to ensure that the refractory brickwork does not have to be disturbed when the tubes are cleaned, as this work can be entirely carried out from the front of the boiler. In consequence, only a nominal amount of space is required at the rear, and a compact boiler house can, therefore, be arranged. A full complement of controls is provided, including an over-riding low-water cut-out, which complies with leading insurance companies' latest requirements.

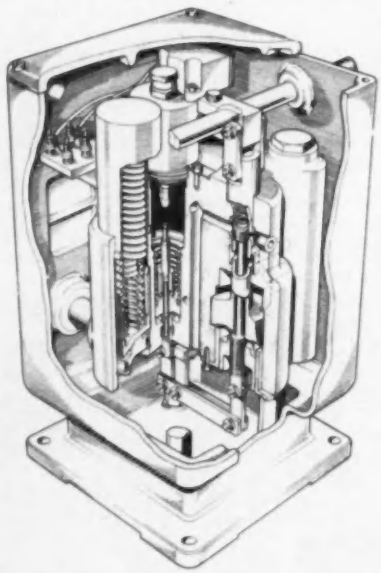


Governors for Prime Movers

A SERIES of governors designed to cover the requirements of a wide range of prime movers are now being manufactured at the works of Ardleigh Engineering Limited, Standard Ironworks, Port Lane, Colchester. Recently, we had the opportunity of visiting these works and seeing some of the governors under construction, and others on test. These governors are grouped in five separate design series, and each series includes a number of types to suit particular applications.

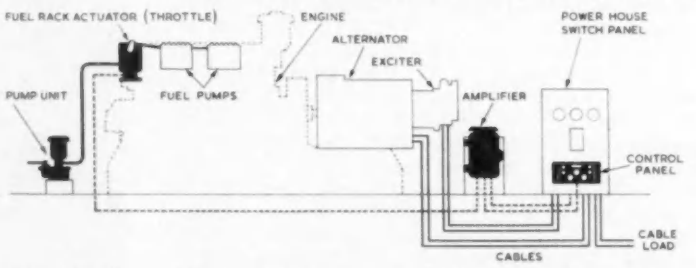
In the governors of four of the series, speed is measured by a fly-weight and spring system, capable of responding very rapidly to changes in speed of the order of half a revolution in 2,000. This flyweight/spring system operates only to actuate a separate hydraulic servo system which in turn does the work of operating the fuel control mechanism of the prime mover.

One of the series of governors, known as the "300," is intended for most traction and general purpose applications, including generator sets. It incorporates a resetting (or integrating) device whereby an engine can be set to operate at a constant steady speed irrespective of load. It includes isochronous governors, or those with any value of droop up to 10 per cent. These units require an external oil supply of pressure oil for the operation of the governor, with a minimum pressure of 40 lb./sq. in. which is normally supplied from the engine lubricating system. They operate over a speed range of 400 to 2,000 r.p.m. at the governor rotor, and the stalled work capacity varies directly with the oil pressure available. At a supply pressure of 40 lb./sq. in the governors produce a stalled work capacity of 3 ft.-lb. and at 160 lb./sq. in. 12 ft.-lb.



(Left). Cut-away view showing construction of Type 500 fuel rack (or throttle) actuator.

(Below). Schematic arrangement of a 500 type Ardleigh governor installation.



Four types of integral speed controllers available with the governors in this series include an eight-step electro-hydraulic controller, a stepless pneumatic-electric controller, an electro-solenoid packer gear controller, and an electric motorised controller.

The "400" series governor is based on a flyweight, servo-assisted governor design, by which most demands of the user can be met. It has been developed for accurate governing purposes, and is capable of keeping the prime mover transients within ± 4 per cent. for full-load changes.

It is self-contained with its own oil pump for supplying working pressure fluid, and has a maximum stalled work capacity of 35 ft.-lb. The rotor speed has four ranges with a minimum speed of 200 r.p.m., a maximum speed of 4,500 r.p.m., and a speed range ratio for each range of $7\frac{1}{2}$ to 1. A permanent droop adjustable from 0-10 per cent. can be operated while the engine is running. These governors have a built-in flexible coupling, incorporating adjustable damping for drives containing unacceptable cyclic variations. They can be split into two parts so that the flyweights in the main body can be driven from the best available position and be connected through piping to the power jack section mounted adjacent to the fuel racks or throttle of the prime mover.

In another series, the "500," the governor has been developed to give very accurate control of prime movers for generating purposes, where any alteration in frequency under varying load conditions must be kept to a minimum. This governor is of unconventional design. The basic conception is an electrically-operated load sensing device which continuously positions the fuel racks (or throttle) according to the load on the engine. The governor therefore primarily controls the prime mover according to the load required. It operates in conjunction with a secondary control for trimming the speed. Thus, as soon as a load change occurs, a signal proportional to the load is given to the solenoid-operated actuator which moves the fuel control linkage to the correct position corresponding to the engine load and then trims the position with respect to speed (frequency). The actuator is designed for a stalled work capacity of 10 ft.-lb. and can be mounted in any convenient position on the prime mover, as no mechanical drive is required. At present, this governor is only applicable to a.c. alternator sets, where extremely fine control of speed is mostly needed. It is capable of being adjusted on load from 5 per cent. droop through zero droop to a 5 per cent. negative droop, if required.

In the "600" series, the flyweight spring system is

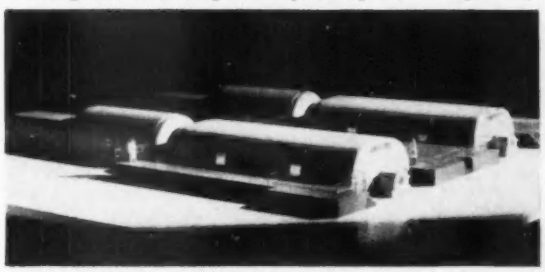
servo-assisted, and the governor has a droop characteristic adjustable between 2 and 10 per cent. Double-acting control is effected by a power piston of differential area design, and the work capacity is varied by altering the delivery pressure from an integral oil accumulator. These governors operate over two speed ranges, from 300 to 2,000 r.p.m., and in each speed range the ratio is 5 to 1. An oil pump is built into the governor and the output work capacity is 7.5 ft.-lb. at 125 lb./sq. in. and 15 ft.-lb. at 250 lb./sq. in. Speed setting can be arranged for a lever, a hand-wheel, or a motorised control, which enables remote fine adjustments of speed change for use when paralleling alternators.

The "700" series governors have been developed in order to fill the need for a small-sized general purpose governor with accurate control, coupled with sufficient work capacity to enable the majority of small or medium-sized prime movers to be controlled. The "700" series is manufactured on a sub-assembly basis, starting with the type 703 isochronous governor which relies on the engine lubricating oil pressure to operate the servo mechanism. The 702 governors have basically the same components but with the addition of a boost oil pump; this boosts the oil feed pressure sufficiently to operate the governor servo mechanism. Types 407-5-6 include an adjustable droop mechanism and a boost oil pump, and these models can be fitted with a spring drive assembly. The type 701 includes an additional assembly for torque converter applications and also a boost oil pump. A stabilising control is obtained by means of a hydraulic feedback system. The power piston is of a differential area design which gives double-acting control. The types 704-5-6 governors have a droop control, adjustable externally, between zero and 10 per cent. droop. When a droop control is incorporated in the governor, it is obtained by a mechanical feedback system from the power piston to the pilot valve. The whole governor can be mounted horizontally in order to reduce the overall height; this in some cases would simplify the governor drive. The governor operates over a speed range from 500-2,000 r.p.m. and stalled speed capacity varies with the oil pressure. At 150 lb./sq. in. oil pressure this capacity is 5 ft.-lb., and at the maximum of 250 lb./sq. in., it is 8 ft.-lb. A spring drive device can be fitted to types 704-5-6, to minimise the effect of any cyclic speed variations being transmitted to the flywheights.

A governor test house has been provided, and it is fully equipped with testing and special calibrating plant on which the characteristics of most types of prime movers can be simulated.

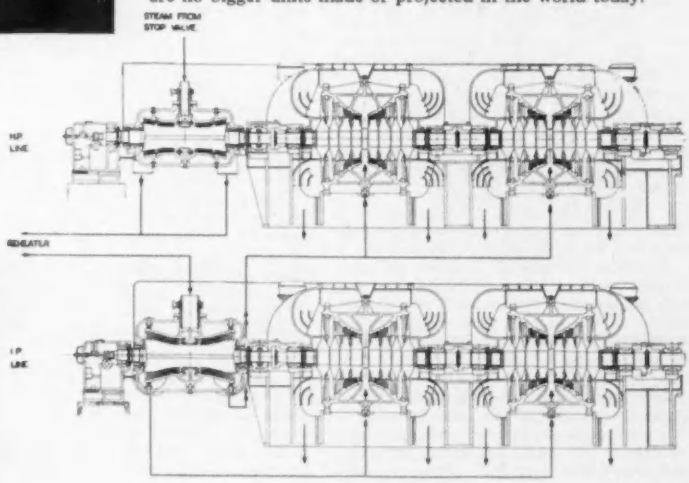
U.S. CONTRACT FOR C. A. PARSONS & CO. LTD.

C. A. Parsons & Co. Ltd., of Newcastle upon Tyne, have received an important contract from the Tennessee Valley Authority of America. This contract, the value of which is approximately 12 million dollars, calls for the supply of a 500-MW tubo-alternator—a cross-compound unit comprising two lines of turbines each driving a hydrogen and liquid-cooled generator at a speed of 3,600 r.p.m., and operating with steam conditions of 2,400 lb./sq. in., 1,050 deg. F., with reheating to 1,000 deg. F. Each line of the machine will comprise three turbines, all of the double-flow type. One line will consist of a high-pressure turbine and two low-pressure turbines, whilst the second will comprise an intermediate-pressure turbine and a further two low-pressure turbines. Due to the high steam conditions, a double casing design will be employed on both the high-pressure and intermediate-pressure cylinders. All the turbine shafts will be rigidly coupled including the couplings to the rotors of the generators.



(Above). Model of the 500-MW cross-compound turbo-alternator set ordered from C. A. Parsons & Co. Ltd. for the Tennessee Valley Authority, U.S.A.

(Right). Schematic diagram indicating the steam flow to the two lines of turbines.



The generators themselves will have a rating of 250 MW, 0.9 P.F., 24,000 volts, generating current at a frequency of 60 c/s and will be of hydrogen and liquid cooled design, using rotors of the direct gas-cooled type operating in hydrogen at a pressure of 45 lb./sq. in. The stator winding will be cooled by liquid circulating through hollow stator conductors.

It is of interest to note that Parsons first supplied generating plant to America in 1912 when a 25-MW machine was ordered by the Commonwealth Edison Co. of Chicago for their Fisk Street power station. On the reputation of this machine, no guarantees were demanded from Parsons as to steam consumption for a more important later machine, a 50-MW set, ordered by the same company in 1922 for their Crawford Avenue power station. After the machine had been in almost continuous operation for 18 months, tests showed a heat consumption per kW hour corresponding to a thermal efficiency of 34.02 per cent.—a remarkable figure at that date. The 550-MW unit for the C.E.G.B. Thorpe Marsh power station is also being supplied by C. A. Parsons & Co. Ltd., and there are no bigger units made or projected in the world today.

The Engineering, Marine, Welding and Nuclear Energy Exhibition

Accles & Pollock Limited, *Oldbury, Birmingham*

Precision tubes for nuclear power plant requirements will be the main theme on the Accles & Pollock stand where a particularly interesting exhibit will be a standpipe head made for use by The General Electric Co. Ltd., in the Hunterston station. Many of the new developments being applied in nuclear power stations will also have a much wider interest for engineers in other fields. These include tubes with extremely thin walls, in stainless steels and other metals, and the convoluted flexible tubing and bellows made from such seamless thin-wall tubes. Another recent development that will be on show is extended surface tubing on which helical gills are formed, these being integral with the actual tube wall. A full range of precision tubes for scientific instruments, examples of coils and other tube manipulation processes will also be exhibited. In connection with straight tubes there will be a display of welded and welded drawn stainless tubes.

Accurate Recording Instrument Company, *Windsor Avenue, Merton, S.W.19*

Representative examples of the comprehensive range of "Aric" instruments, including indicating and recording pressure gauges, indicating and non-indicating thermostats, temperature recorders and controllers, dial thermometers, vacuum gauges, and controllers for temperature, pressure and level, will be shown by this company. Among the "Aric" standard ranges of temperature indicators, pressure gauges, controllers and recorders, is an improved indicating thermostat specially designed for industrial uses. Where accuracy over any suitable range between 240 and 500 deg. F. (or centigrade equivalents) is required, the "Aric" fully-compensated liquid-expansion thermometers are finding a wide range of applications. Also to be exhibited is a multi-reading tank-gauge of the hydrostatic-type which can give up to five readings from different tanks on the same dial.

Air Control Installations Limited, *Victoria Road, Ruislip, Middlesex*

Exhibits of special interest on this stand will be a demonstration unit of the new "Amerjet" reverse-jet fabric collector; a new high-velocity air-filter, the "Electro-Cell," which is claimed to be 30 per cent. smaller in face area and requires only a half the cubic space of the conventional electrostatic filter; and a new development in fan engineering, the adaptable cast fan, on which the angle of discharge is infinitely adjustable on site. Other exhibits include a working model of the "Rotoclone" type-N hydrostatic precipitator; the modified version of the "Roll-O-Matic" air-filter, which is being currently employed at the Berkeley nuclear power station; and a selection from the company's range of small blowers.

The 1959 Exhibition is being held at Olympia, London from 16th to 30th April, and these notes review some of the exhibits—particularly those concerned with steam and power generating plant and associated equipment and auxiliaries.

Aiton & Co. Ltd., *Derby*

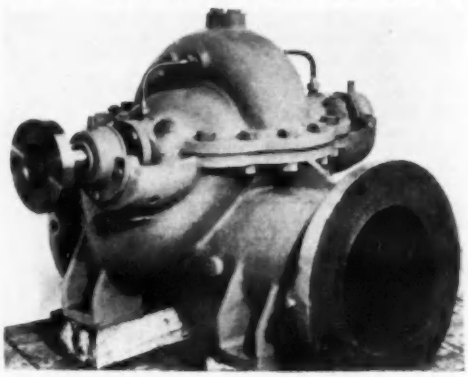
The Aiton exhibit will include a two-stage marine flash evaporator-distiller; the P.W.V. mixer for industries where fluid-mixing processes are involved; and the Aiton "A"-type expansion fittings. Pipework for extra high-pressure, high-temperature steam-raising plant will be covered by five pipes representing the full range of steels (alloy and carbon) normally supplied by the company for power station service. There will also be included an example of corrugated pipework. The company's range of "Uniload" constant-load pipe supports will be represented by a working model which will demonstrate the principle of operation.

Albright & Wilson (Mfg.) Ltd., 1, *Knightsbridge Green, London, S.W.1*

This company are well-known as suppliers of phosphates for boiler water conditioning, but on this occasion they will demonstrate a wide range of metal treatments. These will include the "Plusbrite" bright nickel plating process, and "Phosbrite" solutions. There will also be a demonstration of "Kanigen" plating—a hard, corrosion-resisting nickel-phosphorus alloy used extensively by the aircraft and nuclear engineering industries.

W. H. Allen Sons & Co. Ltd., *Queens Engineering Works, Bedford*

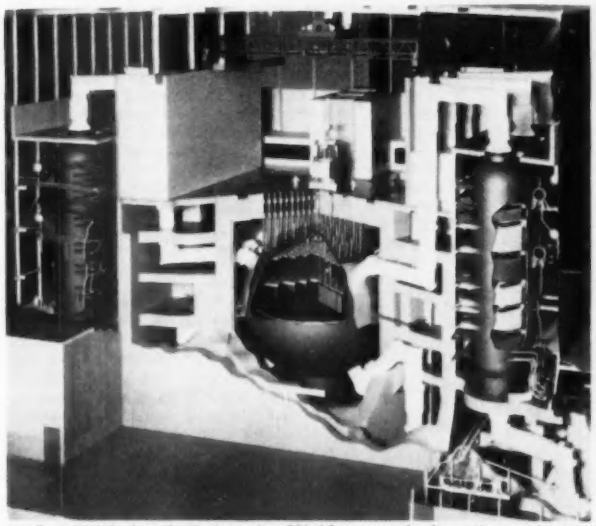
The exhibits on this company's stand will be representative of the wide range of Allen power-generating plant, pumping machinery and electrical equipment, which includes steam turbines, diesel engines, gas turbines, steam engines, pumps (centrifugal, mixed- and axial-flow types), gearing, alternators, d.c. generators, motors (a.c. and d.c.) and control gear for marine, industrial and essential services. The main items will include a vee-form diesel engine-driven d.c. generator for marine duty and a working scale-model of a vertical in-line type of Allen diesel engine generating set. There will also be featured a rotor for a 1,750-kW marine-type pass-out turbo-generator, and three pumping units comprising prototype double-suction pumps designed for preliminary testing purposes—one each for a waterworks, sewage works, and a nuclear power station installation. Allen gearing will be represented by a prominent exhibit comprising a two-speed epicyclic gear unit for a mine tunnelling machine.



Prototype of an Allen pump for circulating-water duties at a nuclear power station. Capacity 2,000 gal./min. against a 67-ft. head, at 2,450 r.p.m. (W. H. Allen Sons & Co. Ltd.)

Babcock & Wilcox Limited, *Babcock House, 209, Euston Road, N.W.1*

The Babcock & Wilcox stand will have a wide range of displays and models, dealing with marine boilers, cyclone-firing, supercritical-pressure steam-generation, oil-fired boiler plant, new developments in pulverising mills and progress in nuclear engineering. Nuclear power exhibits have a prominent place in view of the company's leading position in this field, and the three relevant displays refer to the manufacture of plant for the Hinkley Point nuclear power station, and of a variety of components for nuclear power generation and research; also to the widening of the company's activities through technical collaboration with The Babcock & Wilcox Company of America. The nuclear and marine displays both touch interestingly on progress in nuclear ship propulsion. Shown for the first time in Great Britain are sectional models of a reactor group and of a steam-raising unit for Hinkley Point; and dominating the nuclear exhibit will be a dramatic painting, also shown for the first time



Cut-away model of one of the reactor buildings of Hinkley Point atomic power station now being built by the English Electric-Babcock & Wilcox-Taylor Woodrow Atomic Power Group.

in Great Britain, depicting the Hinkley Point station under construction. The display of oil-firing exhibits will cover the whole range from power station boilers through a variety of industrial types, including "packaged" boilers for both steam and hot-water supply, and will be accompanied by details of Babcock oil-firing equipment and sectioned models of typical boiler units.

Baldwin Instrument Co. Ltd., *Lowfield Street, Dartford, Kent*

A large variety of valves and power cylinders will be shown on this stand, many of them quarter-sectioned in order that methods of construction and quality of finish may be inspected. This company manufactures a wide range of power cylinders, in bore sizes from 1½-8-in., and over 500 control valves in bore sizes from ⅛-1-in.

Birlec Limited, *Erdington, Birmingham, 24*

Exemplifying a new series in the well-known range of Birlec mesh-belt conveyor continuous furnaces for annealing and brazing, the main exhibit on this stand will be a Hump-back furnace, rated at 20-kW, and with a conveyor belt 6-in. wide. For exhibition purposes, the furnace will be equipped with a standard Birlec exothermic atmosphere generator of a recent and simplified design suitable for the smaller range of furnaces. The atmosphere generator is a product of the Dryer and Gas Plant Division of Birlec Limited, who are also showing a new design of laboratory dryer. The application of Birlec dryers to factory compressed-air systems is also illustrated. A model of the Birlec sealed-quench furnace will be shown, arranged to illustrate an automatic operating cycle under timed-sequence control.

The Birmingham Battery & Metal Co. Ltd., *Selly Oak, Birmingham, 29*

The Birmingham Battery & Metal Co. Ltd. will be exhibiting a comprehensive range of tubes, hot-rolled sheets and plates in copper and copper alloys. One of the heaviest condenser plates in yellow metal produced in this country, weighing 2¼-tons and being 10-ft. 6-in. dia. × 1¼-in. thick, will be exhibited, together with examples, illustrations and models of "Battery" material fabricated into heat-exchangers, condensers, saltwater supply pipes, tanker heating coils, etc. In addition, a range of hot brass stampings such as impellers, flanges, etc., of special interest in chemical, petroleum and general engineering industries will be displayed by Guests Brass Stamping Co., a subsidiary organisation.

Keith Blackman Limited, *Mill Mead Road, N.17*

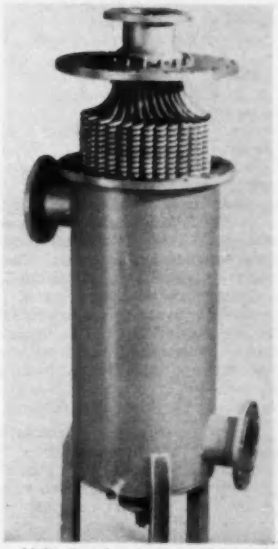
Exhibited for the first time by this company will be the "Aristocrat" range of centrifugal fans for heating and ventilating applications, air conditioning and general ventilation, with an initial capacity range up to 9,000 cu. ft./min. at 3.5 in. w.g. Representative of larger fans in the company's extensive range is a 70-in., type AR, impeller with backward-bladed aerofoil section blades, providing efficiencies of up to 90 per cent. This fan is used for induced-draught, air-conditioning, and mine ventilation purposes and handles large air volumes against moderately high resistances. Photographs will depict other large and heavy fan types. The display will also cover the company's standard stock fans such as the bifurcated fume-removal unit, the APA ventilating fans and the four-way welding fume exhaust unit.

British Arca Regulators Limited, *Sisson Road, Gloucester*

A prominent position on this stand will be occupied by the company's latest double-beat diaphragm-valve, which has already undergone exhaustive tests on various industrial plants and a nuclear power station. Other valves on display will be the well-known Arca single-seated balanced and ported valve (in this type of design, when applied to the control of steam, throttling occurs at the ports and not across the seat), the disc-type butterfly valve and the direct-cylinder-operated valve. Also on view will be single and multi-term controllers for such process variables as pressure, temperature, liquid-level, flow and humidity; and a range of Arca Continental controllers and a valve positioner. From the field of electronics, an electro-pneumatic adjustable three-term controller will be on view. A diagram depicting an automatic surface-type desuperheater with a console-type control panel will illustrate one facet of the desuperheater production of this company. British Arca Regulators Limited are now the sole distributors in Great Britain for Schaevitz linear variable differential transformers and will be exhibiting a range of these transducers.

British Boiler Accessories Limited, 62/3, *Fenchurch Street, E.C.3*

The company's "Helitube" heat-exchanger will be featured on this stand, together with the B.B.A. steam accumulator systems and the B.B.A. dejector—a boiler water-softener and sludge extractor. A new type of constant-pressure accumulator will also be exhibited, which enables the benefits of the company's variable pressure accumulator to be obtained without requiring low-pressure steam consumers. Surplus steam is used to heat the feed water, and it is then stored in the accumulator and fed to the boiler as the steam load exceeds the normal boiler output. Increases in steam output from the boiler can be as high as 30 per cent.



Helical tube heat exchanger. (British Boiler Accessories Limited)

British Ermeto Corporation Limited, *Beacon Works, Hargrave Road, Maidenhead, Berks.*

This company are manufacturers of a wide range of high-pressure fittings, valves and couplings, a representative selection of which will be exhibited. Incorporated in the couplings is the

Ermeto joint which comprises a body portion, a nut and sealing ring. Although this is true of most compression joints, in this case the joint is not based on the compression principle, as the sealing ring is not compressed on to the surface of the pipe. As the nut is tightened, the sealing ring moves along the pipe and cuts a ridge into it. It is this ridge which is the unique feature of the joint, and provides the means of achieving the pressure-holding qualities for which the Ermeto couplings are so well known.

New high-temperature dial thermometer. (The British Rototherm Co. Ltd.)

The British Rototherm Co. Ltd., *Merton Abbey, London, S.W.*19

The British Rototherm Co. Ltd. will be exhibiting a comprehensive range of dial thermometers, recorders and controllers. Among the bi-metal instruments will be one exhibited for the first time, a new high-temperature thermometer specially designed for diesel engine use. Also in this group will be rigid stem thermometers with dial sizes from 1-in. to 7-in. in a wide variety of temperature ranges, presentations, stem lengths and diameters for most engine-room, marine, boiler-house, and associated purposes. Max./min. and control/alarm thermometers and special designs for most industrial applications are included, together with mercury-in-steel thermometers; vapour-pressure thermometers; mercury-in-steel temperature recorders; pressure recorders; and pressure, vacuum, altitude and hydraulic gauges.

The British Steam Specialties Limited, *Fleet Street, Leicester*

A comprehensive range of gunmetal and cast-iron flanged and screwed valves, will be exhibited by this company, and on show for the first time will be the "Flumax" high-lift bronze stainless-steel fitted safety-valves. Also exhibited will be Bourdon-type pressure gauges; bi-metallic strip actuated thermometers; and the "Ventalarm" whistling tank filling device. Vee-Reg globe valves in bronze and steel, size range ¼-in.-10-in. screwed and flanged, fitted with "V" ported stainless steel clack and seat, for use on high and low-pressure saturated and super-heated steam and high-pressure hot water, will be displayed, and in addition the Vee-Reg/Rotork electrically-operated valve for remote control. A full range of Velan steam traps for pressures up to 2,500 lb./sq. in. and temperatures up to 1,100 deg. F. including the Velan "Monofloat" steam-trap, designed for discharging condensate at steam temperature; and a range of Velan forged-steel and stainless-steel bonnetless stop and gate valves for pressures up to 5,400 lb./sq. in. and temperatures up to 1,400 deg. F. in sizes ½-in.-3-in. will also be exhibited.

The British Thomson-Houston Co. Ltd. and A.E.I. Heavy Plant Division, *Rugby*

The British Thomson-Houston Co. Ltd. and A.E.I. Heavy Plant Division will be exhibiting a wide range of electrical and mechanical equipment for marine and industrial applications. Among the actual exhibits will be high-speed gearbox and geared motor units; a high-frequency generator; an automatic voltage regulator; a typical BTH "Class MMC" group starter board; and propeller tachometer equipment. Models of hydro-electric and rolling mill equipment will be included, and there will also be a vertical high-frequency motor alternator for induction heating and smelting applications. Other equipment manufactured by the company will be represented by photographic displays.

The Cape Asbestos Co. Ltd., 114 & 116, *Park Street, London, W.*1

A demonstration of the salient characteristic of amosite asbestos—its "flocculence"—will be given by this company, who are the manufacturers of "Caposite" amosite asbestos moulded insulation materials. A new colour sound film showing how crude asbestos is extracted from rock inside one of the Cape Asbestos mines in South Africa will be shown publicly for the first time on the stand. Also featured will be the company's product "Rocksil" rock-wool insulation. A vibration test will demonstrate the material's great resilience and resistance to shake-down.

Clarke, Chapman & Co. Ltd., *Victoria Works, Gateshead* 8, *Co. Durham*

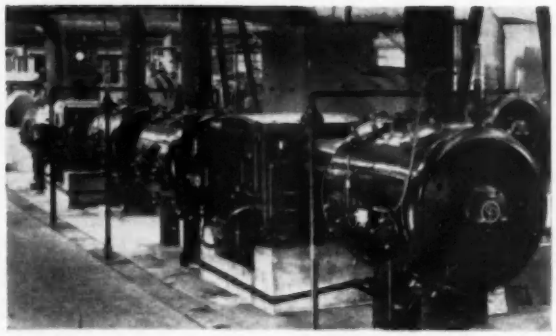
The Clarke, Chapman exhibit will not on this occasion cover their conventional steam-raising equipment, but will be devoted to their marine products. It will include two electrically-driven cargo winches of their latest design, and a steam automatic mooring winch. Models of deck and engine room auxiliaries will be shown, and these include one of the company's latest electrically-driven level-luffing deck cranes and an anchor cable and warping capstan gear.

Cochran & Co., Annan, Ltd., 34, *Victoria Street, S.W.*1

The main exhibit on this stand will be a composite exhaust-gas and oil-fired boiler, designed for a working pressure of 100 lb./sq. in. The exhaust-gas section has a heating surface of 930 sq. ft. and an evaporative capacity of 3,600 lb./hr., from a feed temperature of 50 deg. F. The oil-fired section has a heating surface of 375 sq. ft. and an evaporative capacity of 2,200 lb./sq. in. Other exhibits will include a sectional model of an induced-draught Sinuflo-Economic boiler; a sectional model of a vertical Cochran boiler, fired by a Prior underfeed stoker; a sectional model of a vertical Cochran boiler fired by a "Clyde" oil-firing equipment, and a model of a Ruths steam storage accumulator.

Consolidated Pneumatic Tool Co. Ltd., 232, *Dawes Road, S.W.*6

Exhibited for the first time by this company will be one of their class FE range of horizontal, double-acting balanced-opposed compressors. Units can be supplied for such widely varying needs as the supply of compressed-air at 40 lb./sq. in., or for various industrial processes requiring pressures up to 3,000 lb./sq. in., whilst capacities of up to 5,000 cu. ft./min. are obtainable.



Single stage, two-cylinder type FE-21 compressor of 2,320 cu. ft./min. capacity at 40 lb./sq. in. (Consolidated Pneumatic Tool Co. Ltd.)

Some new additions to the company's range of lightweight pneumatic tools will also be shown, including small 5/16-in. and ¼-in. drills with 45° and 90° angle heads, and a new lightweight angle sander on which "Flexback" pads can be fitted for sanding curved surfaces. Other recently-introduced items to be exhibited will include the "Lagonda" range of tube cleaning equipment.

Copes Regulators Limited, 9, *Southampton Place, High Holborn, London, W.C.*1

Exhibited by this company will be an entirely new type of de-superheater, the first of which is at present being installed in this country. The design,

developed by American associates of Copes Regulators Limited, is stated to eliminate sprays, and to be capable of achieving a 2 per cent.-100 per cent. control with a minimum distance between the de-superheater outlet and the process. Also on view will be a recent addition to the company's range of marine boiler-feed regulators—a power-operated regulator known as the "P" type. It is interesting to note that Copes Regulators Limited are at present supplying more than 100 regulators for installation in nuclear power stations in this country—some of the regulators representing the latest development in pressure compensating regulation, which has made direct-acting modulating control possible for the first time on boilers of this type.

Crane Limited, 15-16, *Red Lion Court, Fleet Street, London, E.C.*4

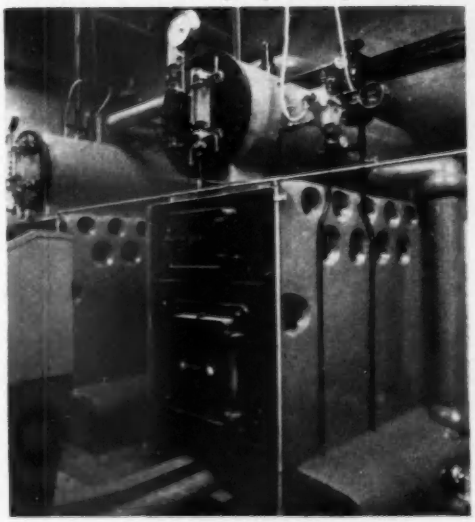
The exhibits on the stand of Crane Limited will include bronze, cast-iron and steel valves for steam, water, gas, oil and air, for high as well as low-pressures, and from sub-zero temperatures rising to 1,200 deg. F. for pipelines from ¼-in. up to 24-in. Included in the display will be an example of a 16-in. cast-steel valve, weighing approximately 1½-tons and standing about 9-ft. high. A particular point of interest will be the Crane patent flexible wedge disc incorporated to overcome sticking, especially in high-temperature service. The valve will be motor-operated, either by direct application or remote control. Almost any size of Crane valve can now be equipped with motorised operation. In addition, the display will include examples of malleable iron pipe fittings, forged-steel flanges, and other materials associated with pipe-lines.

The Darlington Group of Companies, *Darlington, Co. Durham*

The Darlington Group of Companies will be represented by four of its members. The Chemical and Insulating Co. Ltd. is the principal manufacturing member of the Group, processing dolomite limestone to produce magnesia chemicals and insulating materials. The insulating materials cover a wide range of temperature applications, the chief ones being 85 per cent. Magnesia (up to 650 deg. F.), "Metadextramite" (650 deg. F.-1,625 deg. F.) and "Dextramite" (1,625 deg. F.-2,000 deg. F.). "Paratemp," a calcium silicate insulation which has a wide temperature range, has the advantage of being a "one piece" insulating material. Of particular interest among the finishing compounds which complete the Chemical and Insulating Company's range, is their Armouring Compound A.C.1, which provides a finish of high mechanical strength which is weatherproof and does not require painting. The Darlington Insulation Co. Ltd. is the principal insulation engineering and contracting member of the Group. The company is well known as having completed contracts for insulation work at a large number of thermal power stations, and at several of the nuclear generating stations. A particular example is the insulation of the heat-exchanges at Bradwell. The British Refrasil Co. Ltd., are manufacturers of "Refrasil," a pure silica fibre capable of withstanding continuous temperatures of 1,000 deg. C. The fourth company is S. T. Taylor & Sons Ltd., who will show examples of their work in sheet metal and platework.

Drysdale & Co. Ltd., *Bon Accord Works, Yoker, Glasgow, W.*4

This company manufacture a wide range of pumps for both marine and land purposes, including circulating-water pumps. Scale models of several units for various applications will be featured on the stand. The main exhibits will, however, be from the range of marine equipment, and will include an axial-flow horizontal inclined pump for condenser water circulating; a tank-type pump for forced-lubrication; the new twin "Axoil" forced-lubrication pump; a new design of high-speed fire-pump; and the "Centrex" rotary pump.



Example of small boiler plant insulated by The Darlington Insulation Co. Ltd., using materials supplied by the Chemical and Insulating Co. Ltd.

The English Electric Co. Ltd., *London, W.C.*2

The main exhibit by this company will be part of a comprehensive a.c. auxiliary installation under supply for five "B" class motor cargo liners. Also exhibited will be a working model of a 16 CSV exhaust turbo-charged diesel engine, direct-coupled to a salient-pole type alternator, the largest diesel-alternator set manufactured by the company at the present time, and having an output of 2,504 b.h.p., 1,780-kW. Several transparencies of industrial marine and gas-turbine installations will also be shown. The nuclear exhibit included in the display will be a complete scale model of the 500-MW nuclear power station now being built for the C.E.G.B. by the English Electric-Babcock & Wilcox-Taylor Woodrow Atomic Power Group at Hinkley Point, Somerset.

Film Cooling Towers (1925) Limited, *Lionel Road, Kew Bridge, Brentford, Middx.*

The main exhibit on this stand will be a small induced-draught cooling tower, one of the new range of polyester resin bonded glass-fibre units, the access panel of which has been replaced by perspex, to enable the "film-flow," grid packing to be seen in operation. These glass-fibre towers are expected to greatly reduce the maintenance costs experienced on the steel shell towers which they supersede. There will also be on display photographs and diagrams of induced- and natural-draught towers in timber and reinforced-concrete, which the company has erected in this country and overseas.

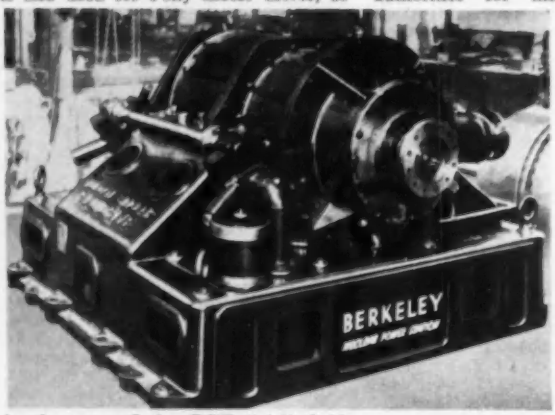
Thos. Firth & John Brown Limited, *P.O. Box 114, Atlas Works, Sheffield, 4*

Exhibits on this stand will comprise a range of forgings typical of the products of the company's Heavy Forge Department, including forged-steel rolls, and carbon and alloy steel bars. There will also be a range of drop-forgings by an associate company, The Firth-Derihon Stampings Ltd. Actual items will include an alternator shaft manufactured for Metropolitan-Vickers for the Electricity Supply Commission (South Africa) for Umgeni power station; a rotor shaft manufactured for the British Thomson-Houston Co. Ltd., for the C.E.G.B. Padiham "B" power station; and an I.P. shaft, hollow end and I.P. shaft, stub end, and an I.P. turbine shaft of hollow construction with the stub end forging for one of four 120-MW turbo-alternators ordered by the C.E.G.B. from C. A. Parsons for the Skelton Grange "B" power station.

Fluidrive Engineering Co. Ltd., *Worton Road, Isleworth, Middlesex*

Among the exhibits on this stand will be the Vulcan-Sinclair double-circuit scoop-trim fluid-coupling, known as the DST, as used for high-power high-speed infinitely-variable speed drives. The DST type of fluid-coupling has the advantage of minimum diameter, as only half the power is transmitted through each working circuit. Five sizes of DST fluid-coupling have been developed, ranging from size-20, which transmits 3,000 h.p. at 3,000 r.p.m., to size-30, which is rated at 20,000 h.p. at 3,000 r.p.m. Considerable numbers of these units are in course of construction for driving boiler feedpumps up to 8,000 h.p. Sixteen units are being supplied for driving the 3,000 h.p. axial-blowers at Berkeley nuclear power station. In addition, sectional models of Vulcan-Sinclair fluid couplings of the standard traction, steel traction, Fluidrive pulley and scoop-control types will be shown, together with working models of both traction and scoop-control fluid couplings. These couplings are suitable for more than 500 different applications, ranging from 1/10 to 20,000 h.p. in a

single unit. An example of an S.S.S. (synchro-self-shifting) clutch coupling will be shown in sectioned form, and be provided with sufficient rotation between the driving and driven members to permit engagement and disengagement of the clutch. This type of clutch, apart from being used in many hundreds of diesel locomotive transmissions of the S.S.S. Powerflow type and in Vulcan-Sinclair dual Fluidrive transmissions, is also used for Pony motor drives, as in the case of the DST "A" fluid-couplings for Berkeley nuclear power station. A feature of the S.S.S. clutch coupling is that it is entirely automatic and shockless in both engagement and disengagement. Two working models will be exhibited, one of them being reversible.



(Left). *One of 16 Vulcan - Sinclair fluid couplings for driving the 3,000 h.p. B.T-H axial blowers at Berkeley nuclear power station. (Fluidrive Engineering Co. Ltd.)*

Fraser & Fraser Limited, *Bromley-by-Bow, London, E.3*

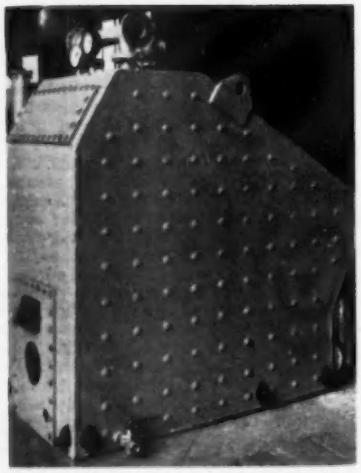
The Fraser radiant-heat water-tube boiler will be featured. This unit is completely water-jacketed, the large water-walled furnace ensuring perfect combustion of solid or liquid fuels, making full use of radiant heat. Straight water tubes at a steep angle promote rapid unidirectional circulation and freedom from scale deposit resulting in high heat-transfer rates. A water-cooled baffle forming the rear wall of the furnace with riser tubes ensuring definite circulation, provides two gas passes, making full use of convected heat transfer from low-temperature gases through the second pass, resulting in high efficiencies of the order of 80 per cent. Access doors are provided for easy tube cleaning, etc. Details and models of other types of water-tube boilers, pressure vessels, tanks, chimneys, flues, buoys, and fabricated platework will also be exhibited.

E. Green & Son Ltd., *Economiser Works, Wakefield*

E. Green & Son Ltd. will this year concentrate on the marine side of their products and will be showing for the first time in this country, the "Tanker-heat" cargo-heating system, especially designed for oil tankers. Also exhibited is the Foster marine economiser. In addition to the foregoing, sample butt-welded tubes in various stages of manufacture will be exhibited and, although not on show, information will be available for all Green's products which include economisers, airheaters, dust collectors, fans and dampers.

Gwynnes Pumps Limited, 62/64, *Chancellors Road, Hammersmith, W.6*

Among the pumps exhibited on this stand will be a special 10-in. axial-flow pump which has been designed and supplied to a number of educational authorities for instruction in their hydraulics laboratories; and a 16-in. axial-flow pump, for use in a land drainage scheme—a vertical-spindle unit, equipped with a grease-pump giving constant supply of grease through a tunnel tube into the pump bottom bearing, and capable of discharging 12.8 cusecs of draining water against a total head of 12-ft. at 720 r.p.m. Another exhibit will be a 6-in. two-stage pump, having two single inlet impellers arranged back to back, thus eliminating the necessity for a heavy ball thrust bearing as the hydraulic thrust is balanced, and a 5-in., seven-stage waterworks pressure pump. A further exhibit will be a special design of dual-purpose Gwynnes fire-pump, capable of discharging a quantity of 500 gal. min. of water at 100 lb./sq. in. pressure at 4,225 r.p.m., utilising one of its two impellers or, alternatively, by bringing a second impeller into series with the first impeller and speeding up to 6,000 r.p.m. the pump discharges 50 gal. min. at a pressure of 500 lb. sq. in.



(Below). *Radiant heat water-tube boiler. (Fraser & Fraser Ltd.)*

Hamworthy Engineering Limited, *Poole, Dorset*

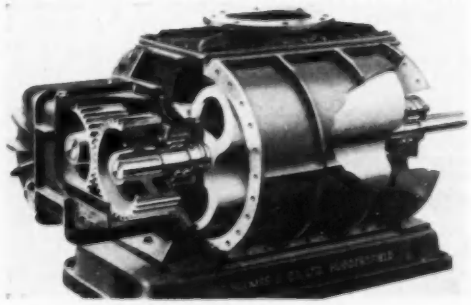
Units from three divisions of Hamworthy Engineering Limited will be shown. From their range of pumps and compressors will be a circulating pump (type-AV24); a vertical centrifugal pump (type-B-10V); a liquid ring primer; gear pumps; air compressors; and two sizes of Aurora turbine-type pumps. Also on this section of the stand will be two screw pumps—one with internal bearings, and the second with external bearings which is being exhibited for the first time in this country. Among oil-burning equipment will be a rotary-cup burner for marine duties; a 24-in. pressure-jet register; and a 5,000 lb. hr. Duplex pumping and heating set. Finally, there will be hydraulic pumps, motors and valves, typical of a wide range of units manufactured primarily for use with mechanised handling and earth-moving appliances.

G. A. Harvey & Co. (London) Limited, *Greenwich Metal Works, Woolwich Road, London, S.E.7*

One of the main exhibits on the Harvey stand will be an 11-ton wire-weaving loom shown in operation. Also featured will be a scale model of one of the test cells for the Rolls-Royce jet-engine test facility at Derby. Other Harvey products will include perforated metals and plastics, woven wire and wire-work, flanges, angle rings, gilled tubes, vents and cowls, heavy-gauge gutters, and plan cabinets, shelving and storage bins in steel. Nuclear Engineering Limited, an associate company, will be exhibiting gamma radiographic equipment for the non-destructive testing of metals, alloys, plastics and assemblies.

W. C. Holmes & Co. Ltd., *Turnbridge, Huddersfield*

Among the exhibits on this stand will be the Holmes inert-gas-generator de-



Cut-away view of a type-RB Holmes-Connersville positive air blower. (W. C. Holmes & Co. Ltd.)

signed to produce an inert-gas to any desired specification by the controlled combustion of gas or fuel-oil; and the Holmes-Kemp dryer, of the totally-enclosed, solid desiccant type, designed to give continuous moisture extraction from air or other gases. Dust collection and control equipment exhibited will include the Holmes-Schneible multi-wash system, applicable to a wide range of dust-collection and control problems involving liquid and solid particles, and with an efficiency of the order of 99 per cent. for all particles above 3-4 microns; the Holmes - Rothemuhle multi-cell cyclone dust-collector designed to minimise stack emissions from hand, stoker and pulverised-fuel-fired boilers; and the Trion electronic air filter, designed for applications where the total dust loading is substantially less than that occurring in heavy industrial plant, but which is sufficiently high to have deleterious effects. Also included in the display will be examples of Holmes-Connersville positive air-blowers, which are of simple design, having no moving vanes, valves, springs or other small parts to work loose, become noisy or wear out.

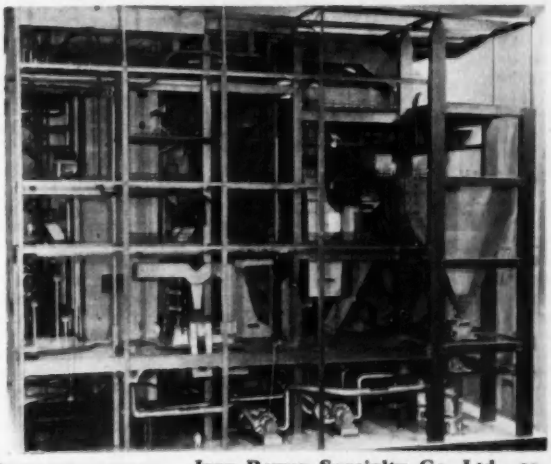
James Howden & Co. Ltd., 195, *Scotland Street, Glasgow, C.5*

To be shown for the first time by this company will be the Howden-Lurgi electro-precipitator, available for a wide range of applications including the cleaning of gases from power station boilers, blast furnaces, sinter plants, coke-ovens, chemical processes, etc. Designs differ according to the application and the specified performance, and include parallel plate types, incorporating one, two or more precipitator zones in series (as required) for horizontal or vertical tubular-type units, with centrally-disposed wire or other suitable discharge electrodes in each case. Alternative designs of collecting and discharge electrodes are available to provide the most efficient operation for different applications, and effective electrode rapping gear is fitted, as necessary, for both discharge and collecting electrodes. The high uni-directional voltage required to operate the precipitators is provided by totally-enclosed static rectifiers of the oil-immersed selenium or other suitable type. Control of each precipitator is centralised in a control cabinet which can be located at any convenient operating position and, in cases where variation of operating conditions may normally be expected, fully-automatic voltage control can be provided to ensure continuous optimum precipitator performance. Also featured by this company will be the Howden rotary-screw compressor, which is usually supplied with a Howden speed-increasing gearbox, and is suitable for compressing or exhausting air and dry non-corrosive gases over a wide range of pressures. The actual exhibit will be a typical single-stage compressor set, comprising a size-8 compressor with speed-increasing gearbox, baseplate and lubrication unit. In addition, there will be a range of rotors for standard and special purpose compressors.

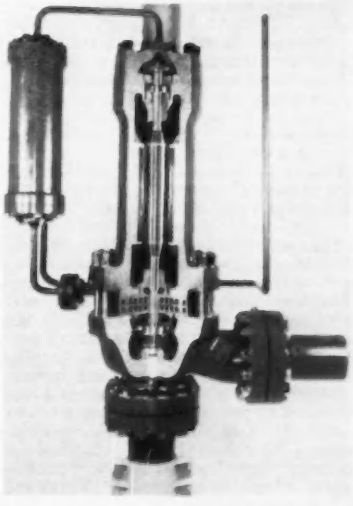
Imperial Chemical Industries Ltd., *Millbank, London, S.W.1*

The I.C.I. Metals Division and Marston Excelsior Limited, a subsidiary company, will occupy a stand in the Grand Hall, where their exhibits will include wrought and fabricated titanium, products for nuclear engineering, heat transfer materials and specialised products. In the titanium section will be titanium turbine blades, power station condenser tubes and funnel exhaust scrubbing equipment. The "new" wrought metals such as zirconium, titanium, niobium and vanadium, will be seen in the nuclear engineering section, where the display will include, I.C.I.

(Right). View of a scale model of the 200-MW boiler for High Marnham power station. (International Combustion Limited.)



(Below). Cut-away view of a glandless circulating pump manufactured by K.S.B. Export GmbH, Frankenthal/Pfalz.



fuel-cans and "Integron" extended-surface boiler tubes. In the section devoted to heat transfer products, typical aluminium alloy and titanium heat-exchangers fabricated by Marston Excelsior Limited, will be on show. The I.C.I. Alkali Division, Billingham Division, and Heavy Organic Chemicals Division will share a stand in the National Hall. This has been designed to interest principally the foundryman.

International Combustion Limited, *Nineteen Woburn Place, W.C.1*

The central feature of this stand will be one of the manifolds for an International Combustion Limited 200-MW boiler under construction at High Marnham power station. This exhibit will be displayed together with a new sectioned scale model of one of the boiler units for High Marnham. In addition there will be a detailed display of the welding activities of the company, and a display representing the work of Atomic Power Constructions Ltd., one of the five British nuclear energy groups, and with whom International Combustion Limited are associated.

Ivor Power Specialty Co. Ltd., 29, *Woburn Place, W.C.1*

Sootblowing equipment for cleaning shell-type and water-tube boilers will be exhibited on this stand, the actual units including the Ivor traversing-jet sootblower, operated by means of chain or extended hand-operating gear; the Ivor industrial gun-type sootblower for cleaning the walls or screen tubes of water-tube boilers; the electrically-operated valve-in-head gun-type sootblower for cleaning combustion chamber walls and convection tubes; and a small retractable chain-operated lance-blower. Sootblowers operated by compressed-air, using a radial piston operated motor, and of particular application to overseas and marine installations, will be on view.

I.V. Pressure Controllers Limited, 683, *London Road, Isleworth, Middlesex.*

On this stand will be exhibited the company's new revised model of the series-396 steam-reducer; stop-valves; needle-valves; solenoid-valves; small and large bore reducing-valves; filters; and a range of test panel equipment. The well-known range of Gestra steam-traps and general steam plant equipment will also be shown, and also included will be a thermo-dynamic steam-trap, the BK.15, available for pressures from 2 to 300 lb. sq. in. on ½-in. or ¾-in. lines. In addition, the company markets as sole selling agents for the United Kingdom, the exclusive range of Haenni pressure gauges, standard models of which will be exhibited.

K.S.B. Manufacturing Co. Ltd., 6, *Broad Street Place, E.C.2*

This company, who are agents in Great Britain for the German organisation, K.S.B. Export GmbH, Frankenthal/Pfalz, will be exhibiting pumps for power stations and for marine applications, as well as canned motor pumps specially developed for the chemical industry. From the wide range of valves and fittings manufactured a slide-valve steam trap with a thermal venting device which operates during the starting-up period, and a glandless valve for atomic reactors will be included. The KSB boiler feed pump, (type HDG.4Z) is available for pressures up to 6,000 lb./sq. in. at temperatures of 590 deg. F. The KSB glandless circulating pumps (types LUV and LUS), to be shown in section by large photographs, are intended for use as circulating pumps in high-pressure, high-temperature boiler plants and are also suitable for circulating pumps in atomic power plants. These are available for outputs up to approximately 10,000 gal./min., heads up to 400-ft., suction pressures (system pressures) up to 3,600 lb./sq. in. and temperatures up to 750 deg. F. Special features of the company's "Una-Special" float-operated steam-trap are its lack of sensitivity to dirt and its tight shut-off even under the most exacting service conditions. For pressures up to 320 lb./sq. in. and temperatures up to 570 deg. F., the trap can be supplied with a thermal venting device for starting-up. A bi-metallic element holds the slide valve open until the temperature has reached about 80 deg. C. so that any air in the system is eliminated during the starting-up period. Only when the temperature rises above the figure quoted does the normal float control come into operation to open and close the valve in the usual way. Without the provision for thermal venting, these traps can be supplied for pressures up to 2,300 lb./sq. in.

Richard Klinger Limited, *Klingerit Works, Sidcup, Kent*

Among the standard range of Richard Klinger equipment will be a number of new items, including a diaphragm-operated automatic return piston valve; a simple internal modification that can be fitted to any Klingerflow valve in the complete range up to 2-in. bore to give the valve a much finer degree of flow control; a modification incorporating rubber O-rings in place of the more usual C.A.F. valve rings to provide a valve particularly suited for service with very high vacuum conditions, again available in a range up to 2-in. bore; and in the range of seatless piston-valves over 2-in. bore, a new KVd valve with improved flow characteristics. Other exhibits will include the eight-unit sleeve-packed cock manifold suitable for gas sampling; a new spherical plug cock; a newly-developed reflex gauge, the "W" type gauge, to meet the needs of a level gauge of simple construction that will comply with the A.S.A. 1,500 lb. Class "B" rating; and a complete range of reflex and "thru-vision" level gauges suitable for the marine industry and for general engineering, including the RTA bi-colour type gauge first introduced in 1958. A selection of Klinger gaskets and a number of components manufactured in Klinger processed synthetic materials will also be included to show the wide application of these materials in many fields of engineering.

Lockheed Precision Products Ltd., *Shaw Road, Speke, Liverpool, 24*

The Lockheed exhibit will feature twelve systems illustrating the application of hydraulics in various fields of industry, and each exhibit will comprise basically photographs of the equipment *in situ*, a piping and wiring diagram of the hydraulic arrangements, and one or two of the hydraulic units incorporated in the system. Systems of particular interest will be those illustrating boiler damper control, actuation of slurry hopper plough blades and controls for furnace door locks, whilst another of the systems will deal with the actuation of various types of valves by hydraulic cylinders, semi-rotary slaves or rotary actuators. The only working exhibit on the stand will be a new semi-rotary slave, a compact hydraulic actuator from a range designed to give at 1,000 lb./sq. in. fluid pressure, torques of 1,500 to 500,000 lb./in., and movement up to 300°—or, with double vanes, approximately twice the torque figures and 120° angular movement. Some of these units are in use on steam valve operation at various power stations. Also exhibited, will be two completely new units—a hydraulic/electric valve and a rotary valve actuator.

Marconi Instruments Limited, *St. Albans, Herts.*

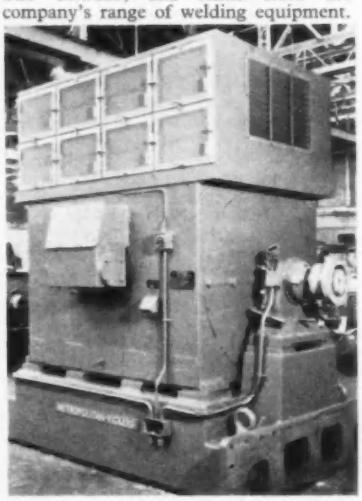
Marconi Instruments Limited will exhibit examples of their industrial X-ray equipment. In addition to a fluoroscopic unit, the units to be displayed comprise a new 90-kV portable apparatus, type-TF 1604/1, two transportable equipments—the TF-1593 and TF-1584—rated at 175 kVp and 160 kVp respectively, and the 110 kVp mobile apparatus, type-TF 1597/3.

Megator Pumps & Compressors Limited, 43, *Berkeley Square, London, W.1*

Megator oil transfer pumps for handling heavy fuel-oil, and a new fuel valve cooling unit will be exhibited by this company, in addition to a selection from their standard range of marine and industrial pumps. Megator unit pressure sets, of which a three-pump version will be shown, provide a complete working unit, including the accessories and fitments, all arranged and connected for efficient operation and simple maintenance. Flexibles between the pumps and valve assembly provide a simple and foolproof method of changing from main to stand-by pumps. The fuel valve cooling unit comprises electrically-driven main and stand-by circulating pumps, either with or without the associated tank containing the heating and cooling coils. Other exhibits will include specially developed accessories including non-return valves, relief valves, etc., as well as a complete range of industrial pumps for a wide variety of uses.

Metropolitan-Vickers Electrical Co. Ltd., *Trafford Park, Manchester, 17*

Of special interest on this stand will be a 3,000-h.p., 3,580 r.p.m. filter-ventilated boiler-feed pump motor (type-HTAS) for supply to the Richard L. Hearn power station, Canada. This motor takes a low starting current, has sufficiently high starting torque to accelerate quickly from rest to full speed, and has special features to ensure reliability, high efficiency, quiet running and to facilitate maintenance. It employs a double-inlet system of air-circulation; a propeller-type fan is fitted at each end of the rotor core and when the motor is running, cold air is drawn into the machine at both ends. This air is directed over the end-windings and through axial air ducts in the stator and over the periphery of the rotor core. It is then deflected through radial ducts in the stator core and finally discharged through a large aperture in the top of the yoke frame. This type of motor is supplied with drip-proof enclosure (with or without air filter) or alternatively as a totally-enclosed, closed-air-circuit machine with water-cooled air-coolers. Other exhibits will include a high-pressure cylinder casing and rotor for the new Eagle oil tanker *San Conrado*, and items from the company's range of welding equipment.



The 3,000 h.p. 3,580 r.p.m. filter-ventilated boiler-feed pump for supply to the Richard L. Hearn power station, Canada. (Metropolitan-Vickers Electrical Co. Ltd.)

Midland Industries Limited, *Heath Town Works, Deans Road, Wolverhampton*

Midland Industries Limited, makers of the well-known MIL range of bi-metallic thermostatic steam traps, pressure-reducing valves and accessories are introducing two new products. Of general interest is an entirely new float-trap with an ingenious mechanism incorporating an air-vent. The general robust construction of all components make the trap ideal for use on the most arduous conditions and where superheated steam is present. Of special interest to hospital authorities is a new instrument and bowl steriliser control

which will be shown under actual working conditions. This unit embodies several unique features, one being that the device will control two variable factors, namely, pressure and temperature. It does not employ expensive capillary tubing but the control valve and temperature-operated pilot valve are connected by small-bore copper piping. A robust stainless-steel bi-metal element is sited in a compact housing and fitted into the vapour space of the steriliser, this element is ultra-sensitive to temperature change and operates the pilot valve which causes the control valve to open or close according to temperature conditions within the steriliser. This control also acts as a reducing valve, and will limit the pressure being fed into the steriliser coils to a predetermined maximum.

The Mond Nickel Co. Ltd., *Thames House, Millbank, S.W.1*

The Mond Nickel stand will feature exhibits which show the properties of nickel, nickel-containing materials, the platinum metals and S.G. iron. Divided into sections, the stand will cover corrosion resistance, plating, welding, physical properties, strength at high temperatures and toughness at sub-zero temperatures. Several demonstrations will be on view for the first time. These include demonstrations of the creep-resistance of the platinum metals, sub-zero properties, integral sheath thermocouples and apparatus for testing the corrosion-resistance of materials under thermal load.

Newalls Insulation Co. Ltd., *Washington, Co. Durham*

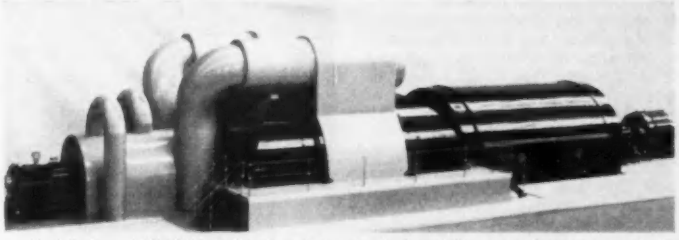
Newalls Insulation Co. Ltd. will be exhibiting their well-known products for all forms of thermal and sound insulation, which in addition to their well established registered brand products—85 per cent. Magnesia, Asbestos, " Newtempheit " and " E.H.T." (extra high temperature), will include a recent development, " Newtherm " calcium silicate. J. W. Roberts Limited, a member company of the Turner & Newall Organisation will exhibit (on the same stand) asbestos reinforced plastics for bearing and wearing applications ; " Feroglas " glass-fibre re-inforced plastics for a wide variety of mouldings ; and sprayed " Limpet " asbestos for thermal, acoustic, condensation prevention and fire-proofing insulation.

Newman, Hender & Co. Ltd., *Woodchester, Stroud, Glos.*

This company will be exhibiting a selection from their wide range of industrial valves. Special units will include Newman-Milliken lubricated parallel plug valves ; Newman-McEvoy automatic self-sealing conduit gate valves ; Vee-Reg combined stop and regulating valves ; the Newman-Seaman-Snap air gas valve ; and Newman-Velan gate and globe valves. Valves and fittings specifically designed for use in the nuclear power field will also be displayed. Items from the company's standard units to be featured will be bronze gate, globe and check valves ; cast-iron and steel gate valves ; forged-steel valves and fittings.

C. A. Parsons & Co. Ltd, *Heaton Works, Newcastle upon Tyne*

A series of models will be displayed on this stand, the most important being of the world's largest turbo-alternator, a 550-MW set, which has been ordered from Parsons by the C.E.G.B. for the new Thorpe Marsh generating station. This machine consists of two lines arranged in line ahead, each line comprising four turbines driving a 275-MW hydrogen and liquid-cooled generator. The operating steam conditions are 2,300 lb. sq. in. at 1,050 deg. F., with reheat to 1,050 deg. F. Other models of turbo-alternator sets will be of one of the two 200-MW sets for West Thurrock power station ; and as an example of turbo-alternator plant in the nuclear field a third model will represent a 100-MW machine with steam conditions suitable for a nuclear power station. Another interesting nuclear exhibit will be an animated sectional model of a graphite moderated gas-cooled reactor and one of its associated steam generators. This model will illustrate the method of controlling the heat generated in a gas-cooled, graphite-moderated reactor, and the passage of the cooling gas through the steam generator via the gas circulator.



Model of a 100-MW turbo-alternator set designed for a nuclear power station. (C. A. Parsons Limited.)

Payne & Griffiths Limited, *Tudor Works, Smethwick, Birmingham*

This company will exhibit a representative range of gauges in sizes from $\frac{3}{4}$-in. up to 18-in. dia. and for pressures of a few inches w.g. to 20-tons/sq. in. In addition to standard types for direct, surface or flush mounting, the company produces many gauges which have been designed for specific purposes, e.g., Duplex differential, diaphragm and capsule types, and gauges with single or double electric contacts. The exhibit will also demonstrate Master test gauges, critical, controller and other precision gauges, as well as a range of cocks, syphons, valves and other fittings.

Reavell & Co. Ltd., *P.O. Box No. 44, Ranelagh Works, Ipswich*

In addition to examples from their range of compressors, this company will feature the Reavell-Askania regulator. These regulators are available to provide complete automatic control of steam boilers including the maintenance of constant steam pressure by controlling fuel supply in accordance with steam demand ; combustion control (including cases where more than one fuel is used) ; furnace pressure control ; and control of feedwater in accordance with the water-level in the boiler drum, and the feed pump pressure. The regulators are also suitable for applications in the field of steam distribution and as a steam turbine control. In recent years, the company has supplied a number of load-limiting regulators to protect turbo-alternator sets against failure of steam supply pressure or condenser vacuum.

A. Reyrolle & Co. Ltd., *Hebburn, Co. Durham*

The central feature of the Reyrolle stand will be a nuclear reactor control-rod head as being supplied to Bradwell power station. Another nuclear exhibit will be a gas-sampling selector valve which automatically and continuously selects the hot circulating gases from a number of fuel channels, and passes them on to a monitoring system which finally records on chart-recorders the amount of radio-activity in the samples. Among switchgear exhibits will be a high-speed auto-reclosing outdoor-mounting circuit-breaker with a current-rating of 200-amp. and a breaking-capacity of 75-MVA at 11-kV ; a weatherproof extensible 200-amp. oil-break circuit-breaker unit forming part of the Reyrolle " J " range of rural switchgear ; and from the same " J " range, a 100-amp. oil-break fuse-switch incorporating rewirable fuse-links with a breaking-capacity of 150-MVA at 11-kV. This latter unit will alternatively take cartridge fuse-links of 250-MVA rating. Also exhibited will be a variable-speed a.c. commutator motor and a 300-amp. welding set as typical of the range of these rotary products manufactured by the company.

Riley (IC) Products Limited, *Nineteen Woburn Place, W.C.1*

The display on this company's stand, which is associated with equipment of International Combustion Products Limited, represents the activities of the International Combustion Group both in the field of solid-fuel-firing and in oil-firing. Two mechanical stokers will be shown as working exhibits, the type-" T " chain-braked, for furnace-tube boilers and also the underfeed " Robot " automatic stoker. The " T "-type stoker is complete with automatic ash-removal equipment. The " Robot " stoker is available in various sizes for use with sectional boilers supplying domestic hot water and central heating services, and to vertical water-tube and locomotive-type boilers employed for steam generation.

Ruston & Hornsby Limited, *Sheaf Works, Lincoln*

A number of entirely new exhibits will be shown by Ruston & Hornsby Limited, and their associates Davey, Paxman & Co. Ltd. The group's stand will be divided into two main sections in which water-cooled and air-cooled diesel engines are to be displayed separately. In the water-cooled engine section, two completely new power units will be seen. These engines are the Ruston "6ATC" and the Paxman "Ventura." The "6ATC" is a six-cylinder, pressure-charged and inter-cooled engine and is the representative exhibit of Rustons' new "AT" medium-speed pressure-charged diesel range, which covers 705 to 1,685 b.h.p. in five sizes—five to nine cylinders. The Paxman "Venture" (described in the March issue of this journal) is a vee-form diesel engine having a "power to weight" ratio which is probably unmatched by any other water-cooled power unit in the 500 to 1,870 b.h.p. range which is covered by this new engine. In the section devoted to a representative selection of the latest air-cooled engines produced by the Ruston Group, will be a model from Paxman's new "Vega" range of Vee-form air-cooled diesels (also described in the March issue of this journal) which cover 200 to 466 b.h.p., and now enables the group to offer air-cooled power units ranging from 4 to 466 b.h.p. The first product from the group's Nuclear Engineering Department is also being shown for the first time. This is the "NFB" gas bearing circulator, designed for circulating gas at high temperatures and pressure without leakage. The rotating assembly of the circulator is carried on bearings which use the pumped gas, air, carbon dioxide or helium as bearing fluids.

Simmonds Aerocessories Limited, *Treforest, Pontypridd, Glamorgan*

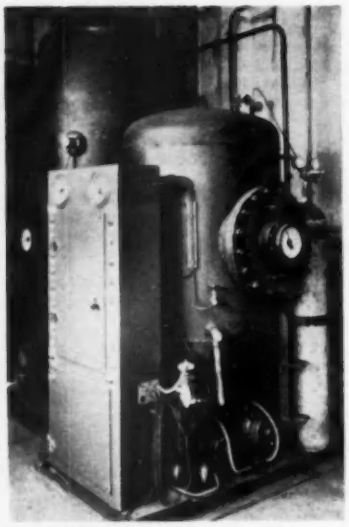
This company, a member of the Firth Cleveland Group, will, in addition to industrial nuts and speed fastenings, be exhibiting "Fram" oil-filters and water-separators; flow control valves; liquid contents gauges; pressure switches; an industrial flowmeter for liquid fuels; and the "Gilbarco" precision electronic contents gauge for deep tanks.

Spanner Boilers Limited, *Wokingham Road, Bracknell, Berkshire*

Apart from marine exhibits which will include a new vertical packaged boiler, a model of a horizontal, wet-back, return-tube packaged boiler and a vertical composite boiler, this company will be showing one of their nitrogen pressurising sets for high-pressure hot water systems. These units are designed to maintain the water system at constant pressure at all times, and to accommodate all expansion and contraction due to temperature changes. A control panel associated with the unit contains all the necessary starters, pressure switches, inter-connecting links, alarms, etc.

Stewarts & Lloyds Limited, *Brook House, Upper Brook Street, London, W.1*

The basis of the display on this stand will comprise examples of the company's



A model from the Spanner range of nitrogen pressurising units. (Spanner Boilers Limited.)

manipulated pipework, and the principal exhibit will be a control rod standpipe produced for Hunterston nuclear power station. Boiler tubes (both seamless and electric resistance weld), jacketed piping, end-to-end welded joints, triform branch reinforcements, a gilled-tube coil, rectangular hollow section (R.H.S.) assemblies, items of marine equipment and a variety of steel castings will be among some of the other exhibits. The Victaulic Co. Ltd., a Stewarts & Lloyds subsidiary company, will be showing a selection of Viking-Johnson couplings, including the standard type; an extra-heavy marine coupling; a coupling complete with supporting bracket; and Viking-Johnson flange adapters. Viking-Johnson "Junior" couplings which are used extensively for ships' refrigeration equipment, and standard Victaulic joints will also be on display. Photographs on the stand will illustrate tubular-steel structures including bridges, jibs, buildings, gantries and towers, manufactured by another subsidiary company—Tubewrights Limited.

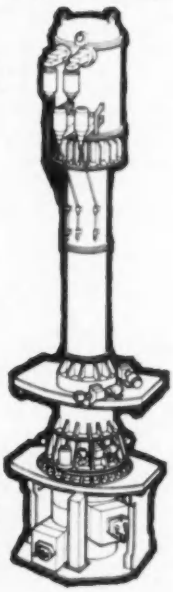
Talbot Stead Tube Co. Ltd., *Green Lane, Walsall*

This company will feature a number of scale models together with actual products for application to the nuclear power field, including pressure vessels; breeder thermocouple guide tubes; fuel element supports; restraint bars; and charge plugs. In addition the exhibit will include the well-known Swirlyflo tubing; Forjend fittings; stainless-steel tubing; and carbon and alloy tubing. Also displayed will be a range of flanges and machined parts; plug cocks and the "Cupford" valve; "Metior" stainless steel fittings; bright-drawn bar and wire; bi-metal tubing; "Metica" metal-clad carbon and graphite tubing; and manipulated and fabricated parts. Swirlyflo tubes are manufactured under a Spanner Boilers Limited patent, and are claimed by the company to increase heat transfer by over 60 per cent.

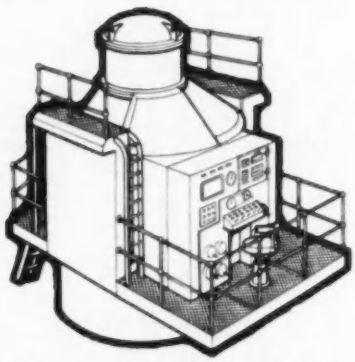
Teddington Aircraft Controls Limited, *Ammanford, Carmarthenshire*

This company will show their range of stainless-steel bellows for expansion joints, suitable to a wide range of specialised applications. For high-temperature piping and ducting stainless steel butt-welded type bellows are produced, from ½-in. to over 7-ft. dia. Also on show will be a range of rectangular units, some measuring 24-ft. × 24-ft. for flues and boiler uptakes on large land boiler installations at power stations in the U.K. An even larger installation

(Right). Line arrangement of a control rod actuator servicing machine. (John Thompson Group of Companies.)



(Below). Line arrangement of the visual observation and removal equipment. (John Thompson Group of Companies.)



is, the company say, at present in the design stage. This will use segments of the expansion joint which will be welded together on site to make a roughly circular assembly 78-ft. in dia. In the more usual type of cylindrical bellows assembly, stainless steel bellows of 6-ft. dia. are being produced in quantity, and 9-ft. and 10-ft. units are envisaged. Among the types of bellows assembly to be shown, are "hinged units" designed to accommodate angulation while containing

pressure forces; "restrained double units" to take shearing movements in a similar manner; axial units with various types of flange or weld-end; and such special devices as gimbal units, instrument bellows, pressure transducers and seals.

The John Thompson Group of Companies, *Wolverhampton*

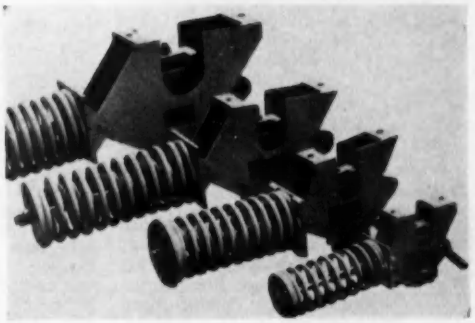
Included in the industrial steam-raising plant section of this stand will be a John Thompson-Wilson "Multipac" wet-back "package" boiler, which, in common with all "Multipac" units, is supplied complete with forced-draught fan, feed-pump, and rotary-cup oil fuel burner. The "Multipac" is made in 11 sizes, with capacities from 2,500 lb. hr. to 18,500 lb. hr. The wet-back combustion chamber dispenses with the necessity for refractory linings, the chamber's adequate volume being obtained by a dished-end design. Illustrated, either by photographs or diagrams, will be water-tube boiler installations by John Thompson Water Tube Boilers Limited; industrial water-treatment plant by John Thompson-Kennicott Limited; complete pipework installations by John Thompson (Pipework) Limited; shell-type boiler installations by John Thompson (Wolverhampton) Limited, which also show the travelling-grate stokers made by John Thompson (Triumph Stoker) Limited; and coal-handling plant by John Thompson Conveyor Company. The nuclear power plant section of the stand will be devoted, exclusively, to displaying the fuel loading unloading machinery for Berkeley nuclear power station. This will be the first time that such equipment has been publicly shown anywhere in the world. Shown as items of plant will be the top 27-ft. of the 50-ft. high fuel chute; and a 4-ft. dia. magazine, an integral part of a fuel charge discharge machine. Scale models of other fuel charge discharge machine parts exhibited on the stand will be the charge discharge machine in its entirety, visual observation and removal equipment, and control-rod and actuator machinery. In the marine boiler section an oil-fired La Mont-type auxiliary boiler of 3,500 lb. hr. capacity being constructed by John Thompson Water Tube Boilers Company will be shown. A model of a dual-pressure boiler will be shown, as also will illustrations of waste-heat recovery boilers and main boilers, and the development of the re-heat cycle. Exhibits in the auxiliary equipment and process plant section will include stainless steel pipework similar to that supplied for atomic energy processing and research stations for radio-active cooling circuits. John Thompson (Dudley) Limited will be exhibiting in the pressure and process vessels section part of a vessel which they are manufacturing for a synthetic fibres processing plant of Imperial Chemical Industries Limited.

John I. Thornycroft & Co. Ltd., *Smith Square, S.W.1*

As at the 1957 exhibition, the Thornycroft exhibits will be shown on two stands, one in the Grand Hall and the other in the National Hall. In the Grand Hall the display will be devoted to the products of the Woolston (Southampton) Shipyard and Engineering Works, and the facilities offered at the company's Repairs Department at Southampton Docks. As the limited stand space precludes the physical exhibition of most of these activities, a large and varied range of photographs and models will convey adequately the extensive capacity of the Southampton establishments. In the National Hall a range of Thornycroft diesel marine engines from 12½ to 200 b.h.p. will be seen. A new model, type-RKRN6S, will be exhibited for the first time. This turbo-charged six-cylinder engine has an intermittent rating of 200 b.h.p. at 1,800 r.p.m., and a continuous rating of 160 b.h.p. at 1,600 r.p.m.

Ronald Trist & Co. Ltd., *Bath Road, Slough, Bucks.*

Industrial smoke density equipment will be included in the display on this company's stand. Exhibited as a working model will be the Electricon smoke-alarm, type-ASB, while the new Electricon smoke density indicator, type-CSB 600, will be on view for the first time. A wide range of Mobrey magnetic level switches will be on view, and there will also be a working demonstration of the Mobrey modulating level-controller, designed primarily for fitting to steam-raising boilers for the purpose of maintaining the water-level closely in relation to the evaporation rate, but which may also be used for the control of liquid levels in many other types of vessels. The Mobrey dual control, now available for working pressures up to 250 lb. sq. in. and designed to combine in one machine the operation of both electrically-driven feedpump control and low water cut-off with alarm for automatic firing apparatus, will be exhibited. Another demonstration unit will show the operation of the Mobrey electric high and low alarm, while several displays will incorporate Mobrey 2, 3 or multi-light alarm panels working in conjunction with Mobrey magnetic level switches.



Model from the Vokes "M" range of support hangers. (Vokes Genspring Limited.)

The Turbine Furnace Co. Ltd., 238*b*, *Gray's Inn Road, W.C.1*

A "Turbine" patent furnace, machine-fired, with fan forced-draught, will be shown fitted to a single-flue, shell-type boiler. The firing of the fuel on the grate is by means of shovel-type stoker equipment with very few moving parts. The furnace consists of a number of separate and distinct units lying side by side, and the design of the grate ensures that the distribution of the air over the whole of the effective area is uniform. The air spaces being very fine, primary air is delivered to the fuel bed in the form of fine sprays, and the bars being forwardly and downwardly projecting, the resistance to the air passing along the trough is very low. Any size and grade of solid fuel can be burned with the highest possible efficiency. At the same time, smoke is definitely under control with forced secondary-air fitted over hand- or machine-fired "Turbine" furnaces, both types having extremely flexible loading conditions. In addition to being suitable for installation to shell-type boilers, large numbers of "Turbine" furnaces are in service in all parts of the world on water-tube boilers burning a wide range of fuels.

Vokes Genspring Limited, *Henley Park, Guildford, Surrey*

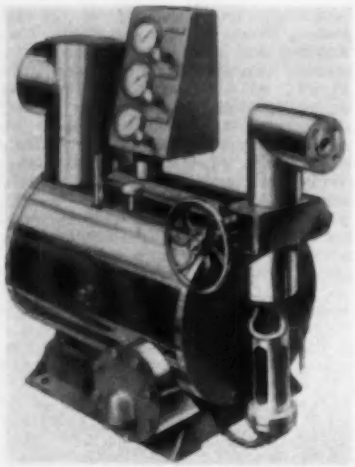
Vokes Genspring Limited, will be showing "M"-type constant support-hangers for supporting pipes and ducting; variable support-hangers for similar applications, but less critical conditions; and sway-braces for the protection of large steam lines, feedwater lines, exhaust, compressor and hydraulic lines, from shock or vibration. On view for the first time, will be a model of the "M"-6, the latest type of support hanger which will be used in the supporting CO_2 cooling-circuit ducting at the Hinkley Point nuclear power station. It is capable of supporting a load of 90,000 lb. over a vertical movement of 4-in. travel. Another new "M" type, the "M"-5, supports 45,000 lb. over a vertical movement of 4-in. Both these supports are capable of accommodating vertical travels of up to 12-in. with reduced loading. Products of Oxy-Catalyst Sales Limited, and Vokes Limited will be shown on the same stand.

Thos. W. Ward Limited, *Albion Works, Sheffield*

On this stand the exhibits will include an extensive range of "Ficep" shearing machinery, including a model CGC 100 G billet and bar shearing machine; a model standard size 25 combination punching, shearing, cropping and notching machine; a model "Beton" B.40 portable bar shearing machine; and a "Colt" shearing, cropping and notching machine. Also displayed will be a large range of hand, lever-operated, bending and shearing machines.

G. & J. Weir Limited, *Cathcart, Glasgow, S.4*

The exhibits on the Weir stand will include a sectional model and a working



The Weir "WL" turbine-driven boiler feed pump, which is of advanced design and operates at 10,000 r.p.m. (G. & T. Weir Limited.)

illuminated display panel to demonstrate the operation of the company's latest two-element boiler feedwater regulator. Three entirely new marine units, the Weir "R2" starting compressor, the Weir "3P" vertical evaporator and the "WL" single-stage, turbine-driven boiler feedpump are to be displayed, together with a typical Weir vertical geared turbine for driving cargo oil pumps, etc.

Worthington-Simpson Limited, *Low-field Works, P.O. Box 17, Newark-on-Trent*

Worthington-Simpson will be showing a representative selection of centrifugal, steam and marine pumps from their wide range of products, together with rotary and "Monobloc" air-compressors, and a marine condensing plant complete with inter- and after-cooler, ejector, and extraction pump. One of the "Monobloc" pumps will feature the new Worthington-Simpson flameproof motor enclosure. A central priming unit designed to provide a reliable means of priming for installations involving a number of non-self priming centrifugal pumps will be shown as a working model. Also displayed will be a closed-feed valve designed to work in conjunction with a surface condensing plant and to provide an automatically controlled closed-feed system. The valve ensures that all make-up entering the system is admitted into the main condenser and it also allows any surplus water not required to pass out of the system to the feed storage tank. The model to be exhibited has a make-up capacity of 25 gal./min. and overflow capacity of 130 gal./min., and is typical of many which Worthington-Simpson have designed and manufactured for both land and marine installations. The industrial oil-cooled rotary air-compressor to be exhibited by the company is the "OCR" 600 compressor, having a displacement of 600 cu. ft./min. and suitable for pressures up to 120 lb./sq. in. Units are available in 200, 300, 450 and 600 cu. ft./min. displacement, and certain of these units can be arranged in tandem to give capacities of 900, 1,050 and 1,200 cu. ft./min. The model to be exhibited from the range of "Cevac" self-priming pumps is of patented "Monobloc" construction and is particularly suited for handling petroleum and other volatile liquids. Its capacity is 300 gal./min. with a maximum head of 116-ft. depending upon capacity. There is a wide range of Worthington-Simpson "Cevac" pumps having capacities up to 350 gal./min. and heads up to 120-ft. A number of different pumps from the Worthington-Simpson "Monobloc" ranges can be fitted with the company's new flameproof motors. The motors themselves are constructed in sizes ranging from 1 h.p. to 7½ h.p., 1,450 r.p.m. and 1½ h.p. to 12½ h.p., 2,900 r.p.m.

Yorkshire Imperial Metals Limited, *P.O. Box 166, Leeds*

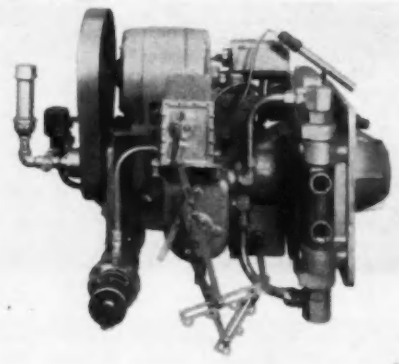
Amongst the wide range of products displayed by this company will be tubes for electrical power plant, including condenser tubes in "Yorcalbro/Alumbro," 70/30 and 70/29/1 brass, "Yorcoron/Kunifer 30A," "Yorcunic/Kunifer 10" and "Yorkshire 70/30 cupronickel/Kunifer 30"; "U"-tubes for feedwater heaters, high-conductivity copper tubes for bus-bars, switchgear sockets and connections, etc. There will also be on view steam condenser and heat-exchanger tube plates and baffle plates, etc., up to the largest sizes, in a wide range of alloys, including bi-metal plates in combinations of steel and stainless steel clad on one or both sides with any of the company's special non-ferrous alloys, to meet dual corrosion problems met with in some applications.

TWO NEW OIL BURNERS

Swinney Brothers Ltd., Wansbeck Iron Works, Morpeth, Newcastle upon Tyne, have designed a completely new range of industrial oil burners suitable for industrial furnaces and boilers. The burners are of the proportioning low-pressure air type and are to be known by the name "Moduflame." Control of the output of the burners is effected by the movement of one lever, either manually or by automatic control, and the air/fuel ratio is maintained constant throughout the operating range. The output of each burner can be varied through a turn-down range of approximately 4½ to 1. Air for combustion, except for a small amount induced around the burner nose, is normally passed through the burner. This air is supplied by a fan at pressures of between 20 and 30-in. w.g., while the oil pressure required is of the order of 10 lb./sq. in. Maximum burner outputs, with all the combustion air passed through the burner, range from approximately 6 to 40 gal./hr. When required for boiler firing the burners may alternatively be used in conjunction with an air register, in which case the burner outputs are increased by about 200 per cent. A feature of the "Moduflame" is that when using heavy fuel oils which require preheating, the hot oil can be circulated through part of the burner body during periods when the burner is not actually in use. Oil at the correct temperature is thus immediately available when lighting-up.

(Left). The "Moduflame" proportioning low-pressure air-pipe oil-burner.

(Right). The "Swinney-Enterprise" rotary oil-burner now being manufactured by Swinney Bros. under an agreement with the General Metals Corp. of America.



Other features are that the air/fuel ratio may be varied while the burner is in operation, and that provision can be made to enable burners to accept oil at different supply pressures without changing any part.

It is also announced by Swinney Brothers Ltd. that they have entered upon an agreement with The General Metals Corporation of America to manufacture, in this country, the "Enterprise" rotary oil burner. These burners, to be known here as "Swinney-Enterprise" rotary burners, are of the horizontal, belt-driven rotary-cup type, and are available in 12 different sizes, covering all outputs normally required for the firing of shell-type, sectional and water-tube boilers. They are capable of handling the heaviest grades of fuel-oil, and have maximum outputs over the range of from 3.5 to 167 gal./hr. Turn-down ratios of approximately 4 to 1 are claimed. The burners are supplied for operation with natural, induced and forced-draught, and in association with a wide variety of control schemes—manual, semi-automatic and fully-automatic. With the two latter systems, fully-modulating or high/low operation can be provided for all sizes. Automatic on/off operation is limited to burners up to a maximum output of 25 gal./hr. For fully-automatic operation, electro-gas ignition is provided, the supply of gas for this purpose being either from a mains supply or liquefied petroleum gas. An integral variable-output fuel metering pump. This ensures that the correct quantity of fuel is supplied to the burner throughout its output range, independent of changes in oil supply pressure or temperature. A further feature is that by correct choice of "combustion head" the flame shape produced by the burner can be varied to suit the dimensions of the boiler combustion chamber.

The Central Electricity Generating Board propose to carry out detailed investigation of two areas on the central south coast to see how far they offer the necessary facilities for nuclear power stations. These are at Earnley in West Sussex and at Hamstead on the Isle of Wight. There is an urgent need to explore ways of expanding power generating capacity in this area to help meet the constantly growing demand for electricity both in the coastal towns on the southern seaboard and in the counties inland. The investigations, like those carried out in other areas, will include ground surveys, trial borings and hydrographic surveys and will take several months to complete. Any proposal to build a nuclear power station that might arise from these investigations would be submitted to the Minister of Power and the planning authority in the usual way.

* * *

Two pamphlets have been received from **George Kent Ltd.,** Luton, Bedfordshire. Publication No. 1517 is an illustrated spare parts list for mercury-in-steel temperature units used in the "Commander" range of instruments. The second publication, No. TP5039, is a reprint of a paper by Mr. G. H. Oughton, technical director of the Foster Instrument Co. Ltd., dealing with primary elements for temperature measurement. Divided into three main sections—resistance thermometer elements, thermocouples and radiation pyrometers, the paper considers the principles, construction and performance of each type of element with special reference to application techniques.

* * *

Harold Gauges Ltd., Frederick Street, Birmingham, 1, have published a comprehensive, 32-page catalogue describing their gauges which range from the simple plug and gap gauge to the most intricate spline, screw and receiver gauges.

* * *

A new leaflet (No. G/46), now available from **Negretti & Zambra Ltd.,** 122, Regent Street, London, W.1, describes the "Ivix" range of pressure gauges, which are manufactured in 4-in., 6-in., and 9-in. sizes. Two measuring units are available—a Bourdon tube movement to cover ranges from 0/60 and 0/10,000 lb./sq. in., and a diaphragm movement to cover ranges up to and including 30 lb./sq. in.

When the Lord Mayor of Birmingham, and Sir Herbert Manzoni, the city engineer and surveyor, visited the Birmingham Engineering Centre recently, they saw an exhibition and demonstration of Dewrance-Croft lapping machines, and pipeline valves arranged by **Dewrance & Co. Ltd.** The object of the exhibition was primarily to afford steam engineers and maintenance engineers in the Midlands area an opportunity to see demonstrations of the lapping machines for reconditioning the seats of parallel-slide and wedge-type valves. Dewrance & Co. Ltd. point out that these machines are the most practical piece of equipment yet devised for lapping, in one operation, both seat faces of parallel-slide and wedge-type valves of any make or type, *in situ*. They are made in three sizes to cover a wide range of valve sizes from ¾-in. to 14-in. and, therefore, meet most requirements of power station, industrial and marine steam plant in this respect. The small machine for valve sizes ¾-in. to 2-in. inclusive, is entirely self-contained and requires no outside source of power for re-conditioning seat faces by lapping. It is manually-operated through a direct drive, alternatively through a 2/1 gearing, which can be used with advantage for the smaller valves. For valve sizes 2½-in. to 8-in. the lapping machine is power operated by an electric or air-operated motor, to suit customer's requirements. For valve sizes 9-in. to 14-in. a machine of heavier construction is available, and is amply suited for the lapping operation in the larger bore valves. Here again, the lapping machine is operated by electric or air-operated motor.

* * *

A new folder issued by **Northern Aluminium Co. Ltd.,** Banbury, Oxfordshire, describes "Noralduct," a solid aluminium sheet having internal systems of passages and ducts, designed particularly for heat transfer equipment. Sheets of "Noralduct" can be formed after manufacture. Either a plain or an impressed pattern finish is available and colour can be included in the product design as there are no welds to spoil the appearance of an anodised finish. The folder includes lists of the present uses of "Noralduct" and some of the possible ones, together with a short description of its manufacture, and a guide to its present tolerances and manufacturing limits.

We have received from the **Cambridge Instrument Co. Ltd.,** 13, Grosvenor Place, London, S.W.1, two new publications. List 144/C describes a range of indicators, recorders, and controllers for use with Cambridge automatic gas analysers of the thermal conductivity type and also includes details of units for the supply and standardisation of the katharometer-bridge current. List 307/2 is the latest edition of the Cambridge list of vapour pressure thermometers, and has been printed in a more convenient form to facilitate the selection of suitable patterns and ranges.

* * *

Mr. George S. Sanders, B.Sc.(Eng.), A.C.G.I., A.M.I.Mech.E., has been appointed, head of the newly-formed Group Productivity Services Department of the Solartron Electronic Group Ltd., Thames Ditton, Surrey.

* * *

Mavor & Coulson's idlers for belt conveyors are described in a new catalogue which includes full tables of sizes and weights, views of applications, sectional illustrations, and an explanation as to how the idlers are able to run so easily for long periods. The types include idlers for belts from 14 to 60-in. cushion rollers of which 70 per cent. is rubber, steering idlers for reversible belts, idlers for picking belts, return idlers—plain, covered, disc for sticky material, and steering—also idler-boards and inverted troughing for carrying the idlers. A new chart quickly gives the width and speed of belts for conveying any of six weights of material at any required rate.

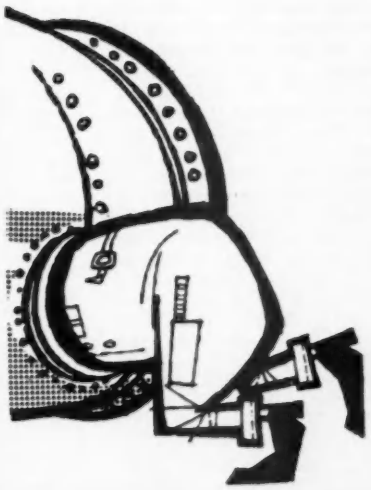
* * *

A splitter absorption type silencer (N.C.S.P.3), specially designed to suppress the whine associated with turbo-blowers on high-speed fans of either the axial or centrifugal type, is described in a new leaflet available from **Vokes Ltd.,** Henley Park, Guildford, Surrey. Velocities up to 100 ft./sec. can be met without any serious deterioration of the special sound-absorbing material incorporated, and units of standard construction can accommodate temperatures as high as 1,000 deg. F.

* * *

Mr. W. F. Stones, F.R.I.C., chemist in the north-eastern division of the Central Electricity Generating Board, has been appointed regional research officer for the North-Eastern and Yorkshire Region.

Anybody in your place
RAISING CAIN
about the cost of
RAISING STEAM?

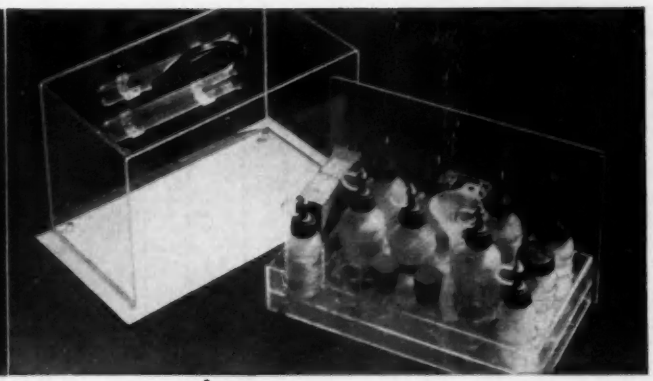


PHOSPHATES
in boiler water treatment

Phosphate conditioning of boiler water is thoroughly established as the most satisfactory method of preventing scale deposits in all types of boilers. Scale cannot form when a reserve of phosphate is present in boiler water. Phosphate conditioning is indispensable at high pressures, and leads to such improvements at low pressures that it is generally preferred to other treatments. Ask your supplier of boiler conditioning chemicals how little you would have to pay to be sure your boiler is scale free all the time.

CONTROL IS SIMPLE

Control of PHOSPHATE CONDITIONING and testing of raw and softened waters is a simple matter using Albright & Wilson's WATER TESTING KIT



For booklet on Boiler Water Conditioning and leaflet on Boiler Water Testing Kit please complete coupon and post to:
ALBRIGHT & WILSON (MFG) LTD
Water Treatment Department
1 Knightsbridge Green
London SW1

Please send me your booklets on
BOILER WATER CONDITIONING WITH PHOSPHATES
and BOILER WATER TESTING KITS

NAME .....

POSITION IN COMPANY .....

ADDRESS .....

.....

.....

TBW/510

Latest Power Plant Patents

These extracts from British Patent Specifications are reproduced by permission of The Controller of H.M. Stationery Office. (Complete British Specifications can be obtained from the Patent Office, 26, Southampton Buildings, London, W.C.2. Price 3s. 6d. each, both inland and abroad.)

Forced-flow once-through steam generator

This invention relates to forced-flow once-through boilers with at least two steam - generating sections, each having a superheater and a reheater. In steam generators of this type, the corresponding heat-exchangers in the different steam-generating sections have been connected in parallel. Difficulties arose in such steam generators because the intermediate steam had to be distributed between the parallel connected reheaters. This necessitated complicated regulating and control devices and expensive and somewhat bulky piping. In addition, the steam reheated in the individual reheaters had not only to be united again before admission to the low pressure turbine, but also to be satisfactorily mixed, since any unequal heat distribution in the parallel combustion chambers and flues would produce differing steam temperatures in the individual reheaters. These disadvantages are eliminated by the invention according to which each steam-generating section has a preheater and evaporator path for part of the total flow of working medium through the steam generator. The preheater and evaporator paths of the sections are connected in parallel, in respect of the total flow of working medium through the steam generator. Each section has a final superheater or each has an intermediate reheater, or the final superheaters or all the intermediate reheaters are connected in series in respect of the total flow of working medium through the steam generator. This arrangement not only avoids the need for distributing the working medium for final heating or reheating between parallel connected heat-exchangers, but it also affords the advantage that by regulating the intensity of the firing in one or other furnace, the temperature of the finally heated or reheated working medium can be regulated within wider limits. Further difficulties arose in the steam generators of known construction because the intermediate steam must be heated to high temperatures; and for this purpose, the intermediate reheaters had to be placed in regions of high flue-gas temperatures. On starting the steam generator, however, there is no steam available for cooling the intermediate reheaters. In consequence, the steam generator had to be started extremely slowly in order that the temperature of the flue-gases should not exceed the maximum allowable temperature for the tube material of the "not-yet-cooled" intermediate reheaters. In one form of the invention, the final superheater or intermediate reheater in one steam generating section is placed in a cooler zone than a corresponding superheater or reheater in another section. By this means, it is possible rapidly to start that section of the

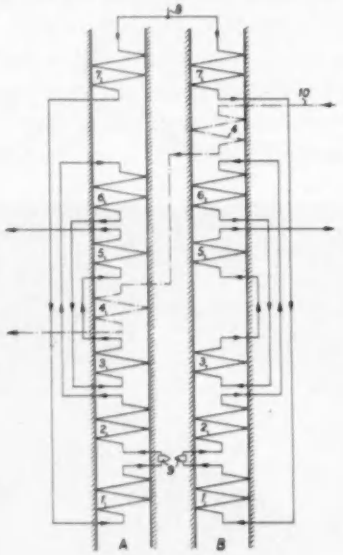


Fig. 1. British Patent No. 807,658.

steam generator which has the superheater or reheater in a relatively cool zone without endangering this heat-exchanger. In the steam generator shown in outline in Fig. 1, there are twin parallel combustion chambers, and flues *A* and *B*. The enclosing walls of the combustion chambers are lines with evaporating surfaces (1) and wall mounted superheaters (2). In the flue *A*, there are placed the heating surfaces of a platen-type superheater (3) of an intermediate reheater (4), a convection final superheater (5), a convection pre-superheater (6) and an economiser (7). In the flue *B*, the sequence of the corresponding surfaces is different because the intermediate reheater (4) is placed between the convection pre-superheater (6) and the economiser (7) instead of between the platen-type superheater (3) and the convection final superheater (5). Combustion air-preheaters (not shown) follow the economisers (7) in both flues. Feedwater enters the steam generator through a pipe (8) and is distributed to the two economisers (7) in the flues *A* and *B* respectively. At the outlet ends of the evaporating surfaces, water separators (9) are provided, from which the steam freed from water enters the wall superheaters (2) and then passes into the convection pre-superheaters (6), into the platen-type superheaters (3) and into the convection final superheaters (3). The steam flows finally from the convection final superheaters (5) and, after combination of the parallel streams, is admitted to a high-pressure turbine (not shown.) The intermediate steam coming from the high-pressure turbine passes through a pipe (10) into the intermediate reheater (4) in the flue *B*, flows through this and then enters the second intermediate reheater (4) in the flue *A*, from which it passes to a low pressure turbine (not shown). *British Patent No. 807,658 issued to Sulzer Freres S.A. Complete specification published January 21st, 1959.*

Forced-flow once-through steam generator

This invention represents a modification of the invention described above (British Patent No. 807,658). According to this patent all the final superheaters or all the intermediate reheaters are placed in regions of approximately equal temperatures. Thus the final superheaters, or intermediate reheaters, can be made substantially identical with each other, and one or other of the furnaces can be put out of action for part-load operation. When use is made of a cyclone furnace, which cannot be throttled down to below about 50 per cent. of full load, it is possible, by using two final superheaters or

two intermediate reheaters, to operate at a part load of only about 25 per cent. of the normal load by shutting down one steam-generating section, and throttling-down the other steam generating section to half-load. One of the final superheaters may have a

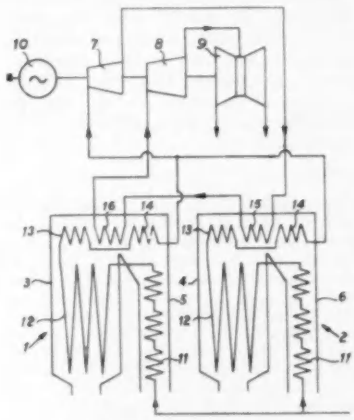
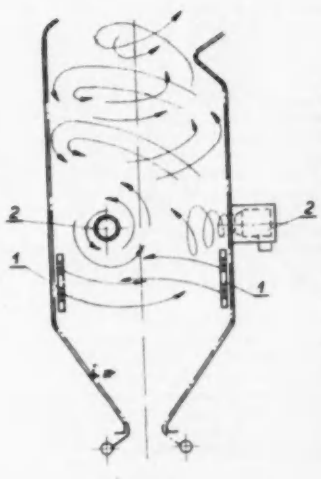


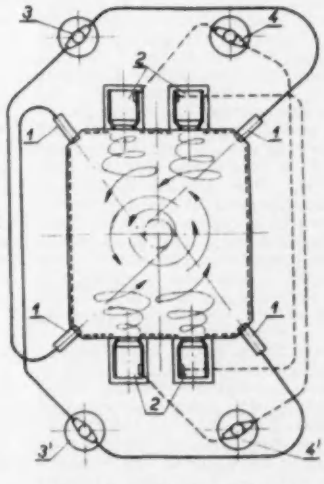
Fig. 2. British Patent No. 808,819.

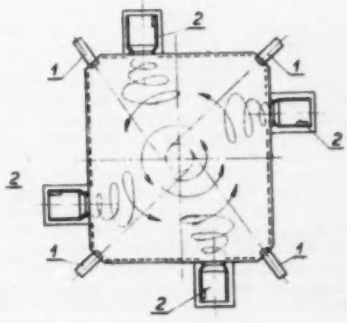
larger heating surface than another. In this way, it is possible, despite the different inlet temperatures of the steam to the individual series-connected final superheaters, to cause the same amount of heat to be transmitted through the heating surfaces of both final superheaters so that the individual final superheaters are equally loaded. Similarly, one of the intermediate reheaters may have a larger heating surface than another. The steam generator shown in Fig. 2 has two furnaces (1) and (2) comprising combustion chambers (3 and 4) respectively, and flues (5 and 6) respectively. The steam generated is delivered to a turbine consisting of a high-pressure section (7), a medium pressure section (8) and a low-pressure section (9) driving an alternator (10). The incoming feed-water is divided into two parallel branches, one in each furnace, and each branch flowing through an economiser (11), then into an evaporating section (12) from whence the steam passes through a first superheater (13) and then through a second superheater (14). After the superheaters (14), the two branches reunite and pass to the high-pressure section (7) of the turbine. After partial expansion of the steam in this turbine, this steam flows through an intermediate reheater (15) in the furnace (2) and then through a second intermediate reheater (16) in the furnace (1). It then passes to the medium-pressure turbine section (8) and the low-pressure turbine section (9). The exhaust then passes to a condenser (not shown) and the cycle is completed. *British Patent No. 808,819 issued to Sulzer Freres S.A. Complete specification published February 11th, 1959.*

Pulverised coal-fired furnace

This invention relates to furnaces for the combustion of pulverised coal. Pulverised coal firing obviously has the advantage that low-grade types of coal may be used. However, these types of coal have often a low softening point which causes slagging of the furnace walls, and choking of the passages between the individual tubes of the tube-banks. It has been found that slag deposits are formed particularly at those points of the furnace where excessive temperatures occur as a result of an insufficient mixing of the fuel and air, which in turn is due to vortex formation within the furnace. Many suggestions have been put forward in the past to overcome these difficulties. However, it has been found that the combustion conditions in a pulverised-fuel furnace with rectangular section can still be further improved according to this invention, if axial-flow burners are mounted in the four corners of the furnace so that they direct their fuel stream substantially towards the centre of the furnace, and if, in addition, turbulence burners are arranged in some or all side walls of the furnace. As is well known, turbulence burners have means for creating flame turbulence and therefore issue a shorter flame than axial burners which are not provided with turbulence forming means, and thus issue a long flame. As a result of the arrangement introduced in this invention, the furnace is more evenly filled over its whole cross-sectional area with streams of combustion gases and the coal particles come into better contact with combustion air so that the occurrence of excess temperatures is practically avoided. As indicated in Figs. 3 and 4, the furnace has a rectangular cross-section and in each corner axial flow burners (1) are arranged which issue a stream of fuel in the direction of tangents to an imaginary small circle in the centre of the furnace. The resulting combustion gases then pass upwardly along a spiral path as indicated by the arrows in the diagram. A turbulence burner (2) is arranged in each







(Top, left) Fig. 3. (Top, right) Fig. 4. (Left) Fig. 5. British Patent No. 809,148.

side-wall of the furnace, which burner issues a turbulent stream of pulverised coal and combustion air into the angular space between the jets of fuel issued from the corners of the furnace by the axial-flow burners. Fig. 4 clearly indicates the uniform distribution of the fuel over the whole cross-sectional area of the furnace in the region where the supply of

the fuel is effected. As shown, the turbulence burners (2) are displaced from the symmetry planes at right-angles to the side-walls and including the vertical axis of the furnace in a direction of the turbulence produced by the four jets issued from the burners at the corners of the furnace whereby the main turbulence flow of the gases from the lower part towards the upper part of the furnace is enhanced. The outline arrangement shown in Fig. 5 differs from that shown in Figs. 3 and 4 in so far as turbulence burners (2) are placed only at two opposite walls of the furnace, and that two turbulence burners are mounted in each of the two walls, one at each side of the symmetry plane at right-angles to the wall and including the vertical axis of the furnace. Fig. 5 also indicates the pulverisers which supply the burners with pulverised fuel. Each two oppositely placed burners (1) are connected to a common pulveriser ($3,3^1$) and each two diagonally-opposed burners (2) are connected to a common pulveriser ($4,4^1$). This connection between pulverisers and burners facilitates the operation at reduced load in which case, for instance, the pulveriser (4^1) with the associated burners, may be "cut out" without affecting adversely the combustion process. At very small loads, even the pulveriser (3^1) with the associated burners may be "stopped," and the main turbulent flow will still be maintained. *British Patent No.* 809,148 *issued to Prvni Brnenska Strojirna, Zavody Klementa Gottwalda, Narodni Podnik. Complete specification published February* 18*th*, 1959.

Mr. J. C. Duckworth, B.A., F.Inst.P., A.M.I.E.E., F.Inst.F., has been appointed managing director of the National Research Development Corporation in succession to the Earl of Halsbury, who had been managing director since it was established in 1949. This is a statutory appointment made by the Board of Trade under the Development of Inventions Act, 1949. Mr. Duckworth has had a distinguished scientific career. After taking 1st Class Honours in Physics at Oxford in 1938, he played a leading part in radar research and development during the war. After the war, he was engaged in fundamental nuclear physics research at Chalk River in Canada and at Harwell, and was later in charge at Ferranti Limited of development and design of the guidance and control system of the guided weapon now known as "Bloodhound." In 1954 he joined the then British Electricity Authority, with responsibility for the design, construction and operation of nuclear power stations; and until March 31st was chief research and development officer of the Central Electricity Generating Board. **Mr. Dennis Hennessey** has been appointed by the Corporation to a new post of deputy managing director. Mr. Hennessey, who was a former principal patents officer at the Ministry of Supply, joined the Corporation's staff in 1950, and was made an executive member of the Corporation in 1956.

* * *

Laidlaw, Drew & Co. Ltd., combustion engineers, of Edinburgh, announce that **Mr. G. Patrick Eadie,** B.Sc., M.I.Mech.E., who joined the company, from New Forge Limited, of Belfast, in 1951, as chief engineer, has now been appointed to the board of directors.

* * *

Mr. J. G. Marsden, late of British Paints Limited, Newcastle upon Tyne, has joined Anti-Dust Services Limited as general sales manager in charge of U.K. Sales.

* * *

James Gordon & Co. Ltd., Stanmore, are holding an exhibition of their products, viz., instrumentation and automatic controls for boiler plant, furnaces, heating installations, steam supplies, etc., at The Victoria Room, Victoria Station Hotel, Nottingham, from April 14th-16th, between 5-30 p.m. and 9-30 p.m. each day. Members of the company's technical staff will be present to discuss any relevant problems.

Electroflo Meters Co. Ltd. opened its training school in October, 1958. Since then, 18 service engineers and instrument mechanics have attended two-week courses. Representatives have been accommodated from Fisons Limited, Winthrop Laboratories Limited, A. E. Reed & Co. Ltd., and the Central Electricity Generating Board. During the lecture courses, typical industrial instruments for the measurement and control of process variables are discussed, demonstrated, assembled and calibrated, with particular emphasis upon maintenance. Such was the success attained during the first three months of the school's existence, that the 1959 enrolments are on an increasing scale. Six courses have been planned during the first six months of the year. Service engineers from the Area Gas Boards, Albert E. Reed & Co. Ltd., Bowaters Ltd., Colvilles Ltd., Woodall-Duckham Ltd., The Electrical Society of Milan, London Airport, I.C.I. Ltd., Albright & Wilson Ltd., and The Scottish Electricity Generating Board will be attending the courses. One of the features of the course, apart from the formal instruction in the operation and servicing of industrial instruments, is the opportunities which are afforded for these service engineers to discuss and exchange views upon the technical problems which daily confront them.

* * *

The United Kingdom Atomic Energy Authority Industrial Group have placed a contract with **John Brown & Co. Ltd.** for the refuelling machine for the advanced gas-cooled reactor at Windscale. This contract will be carried out by the company's special Engineering and Nuclear Division.

* * *

Mr. T. F. Hurley, O.B.E., B.Sc., who recently retired from the position of chief research engineer at the Fuel Research Station, Greenwich, has now joined The National Industrial Fuel Efficiency Service. He will now be in a position to apply his wide experience of research, design and development to the numerous problems which are brought to N.I.F.E.S. by industry. In particular, Mr. Hurley's previous experience on the use of pulverised-fuel for firing small boilers, the measurement and prevention of atmospheric pollution and the efficient combustion of solid, liquid and gaseous fuels should prove invaluable to industrial fuel users.

The Electricity Council have appointed **Mr. G. Morley Davies** to the post of press and information officer. Mr. Davies, who has been engaged in press and publicity work for many years, has been press and information officer of the Merseyside and North Wales Electricity Board for the past three years, and was previously press and publicity officer of the Port of Bristol Authority. The appointment coincides with the retirement after 25 years in the electricity supply industry of **Mr. W. J. Hendry,** who has been the Council's public relations officer since it was established at the beginning of 1958.

* * *

After 43 years' service with Rhodes, Brydon & Youatt Ltd., **Mr. C. S. Youatt** has relinquished his position as deputy chairman, but continues as a director. **Mr. A. H. Parkes,** who has been a director of the company for more than 10 years, and is deputy-chairman and managing director of Small & Parkes Ltd., becomes deputy chairman.

* * *

Ashmore, Benson, Pease & Co. have recently concluded a licence arrangement with the **Mond Nickel Co. Ltd.** by which they are now in a position to supply S.G. or high ductile iron castings in accordance with British Standard Specification 2789/1956. For 25 years, Ashmores have offered high-duty iron castings made by the Meehanite process for a wide range of engineering applications. Under the new arrangements, they will be able to extend their foundry services even further by supplying grey iron, Meehanite iron and spheroidal graphite iron castings to the engineering industries in weights of up to 25 tons in floor, loam, machine moulded and CO_2 moulded castings.

* * *

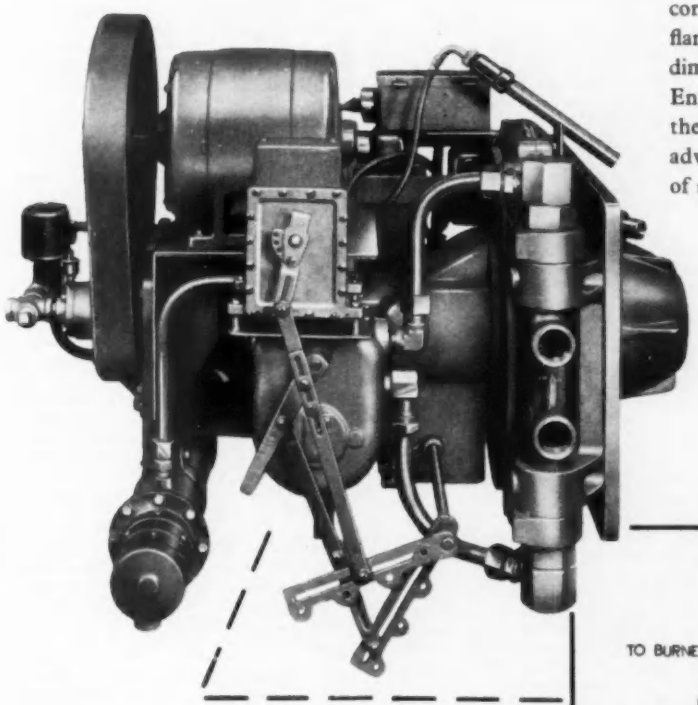
W. H. Allen Sons & Co. Ltd., Bedford, have received a contract from the United Kingdom Atomic Energy Authority for the supply of two diesel-engine-driven generator sets. These sets will provide standby electric power supply to essential services for the advanced gas-cooled reactor at the Authority's Windscale works. The plant consists of two 12-cylinder, vee-form, pressure-charged, Allen type-VBS12 engines, each running at 600 r.p.m., and driving a 600-kW, 240-volt Allen d.c. generator. Each set will be arranged for fully-automatic starting in the event of a failure of the mains supply.

ANNOUNCING THE

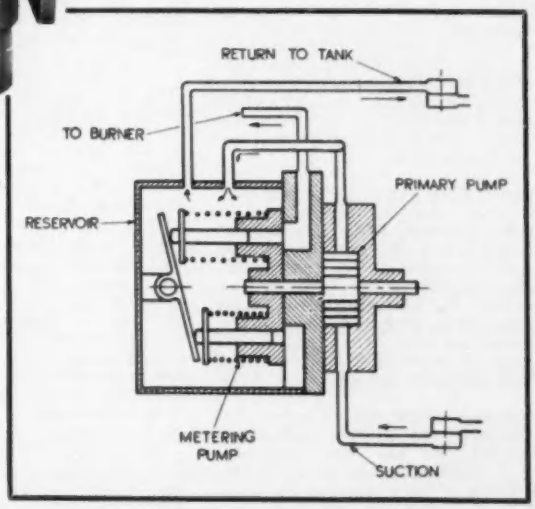
SWINNEY ENTERPRISE

Automatic Rotary Oil Burner

Swinney-Enterprise Rotary Oil Burners are now available in a range of 12 sizes having outputs from 3.5 gallons per hour to 166 gallons per hour and are suitable for use with the heaviest grades of fuel. Burners are available for operation on natural, induced or forced draught and with a wide variety of control systems. By correct choice of combustion head, flame shape can be altered to suit the dimensions of the combustion chamber. Entirely manufactured in the U.K. the Swinney-Enterprise is the most advanced oil burner for firing all types of steam and hot water boilers.



The Measured Rate Metering Pump is exclusive to Swinney-Enterprise burners. Regardless of grade, viscosity or temperature of fuel the metering pump will provide the correct flow of fuel to ensure precise air/oil ratio and efficient combustion.



FOR FURTHER INFORMATION WRITE OR PHONE:—

SWINNEY BROTHERS LTD

MORPETH, NORTHUMBERLAND. Tel: MORPETH 92/3

LONDON: 34 CRUTCHED FRIARS E.C.3. Tel: ROYAL 2977

NOTES *Personal* AND *Industrial*

The Earl of Halsbury has been invited by the directors of Lancashire Dynamo Holdings Limited to join the board of the company as vice-chairman, following his resignation as managing director of the National Research Development Corporation.

* * *

The Central Electricity Generating Board (Midlands and East Midlands Region) announce the appointment of **Mr. E. V. Hardaker,** M.C., B.Sc., A.M.I.E.E., as divisional electrical engineer.

* * *

The Consolidated Pneumatic Tool Co. Ltd., London, announce the appointment of **Mr. Gordon L. Dray,** as manager of the oil division, handling all the company's business in the petroleum field. Mr. Dray, who joined the oil division in 1951, has been with the company for over 21 years and served for 15 years in the Home Counties sales division where his experience in the application of compressed-air took him into all fields of engineering.

* * *

Mr. Wilfred R. L. Kent, B.A. (Eng.), A.M.I.Mech.E., A.M.I.E.E., has been appointed sales director of Cochran & Co. (Annan) Ltd.

* * *

Mr. H. J. Whiteside, general works manager, The British Vacuum Cleaner & Engineering Co. Ltd., has been elected a director of the company.

* * *

Following the recent retirement from active duty of **Mr. J. Horridge,** on medical grounds, **Mr. J. F. Willsher** has been appointed general works manager of George Kent Limited. Mr. Willsher jointed the company in 1947, and in 1951 was appointed production controller, and a year later production manager. In 1955 he was appointed manager of the instrument division, a post he held until taking over his present position.

* * *

Metropolitan-Vickers Electrical Co. Ltd. announces the appointment of **Mr. A. Cormack,** B.Sc. (Eng.), Grad.-I.Mech.E., formerly assistant superintendent, Germiston Works, as superintendent (special duties), Larne Works; and **Mr. R. Harrison** as assistant superintendent, Germiston Works. These appointments have been made by the company in conjunction with the A.E.I. turbine-generator division.

* * *

Crompton Parkinson Limited announces that **Mr. G. H. Armstrong,** A.M.I.Mech.E., has been appointed chief production engineer for the Southern Works of the Crompton Parkinson Group of Companies, and has been succeeded as production engineer at Crompton Parkinson (Chelmsford) Limited by **Mr. G. Cubitt-Smith.**

Anglo Great Lakes Corporation Limited has announced the following appointments: **Mr. H. H. Mullens,** a director of the company, to be chairman, in succession to the late Sir Claude Gibb, **Mr. H. B. Topham,** also a director, to be general manager, and **Mr. D. P. Walton,** secretary, to be a director of the company.

* * *

Mr. A. T. Crawford, M.I.E.E., has been appointed manager, home contracts department, of A. Reyrolle and Co. Ltd.

* * *

Sir W. H. Bailey and Co. Ltd. announces that **Mr. S. Watts** has been appointed chief engineer (contracts division), and that **Mr. B. Scott-Garrett** has joined the company as chief engineer (control division).

* * *

The English Electric Co. Ltd. announces the following re-designations: **Mr. E. B. Banks** as director of Commercial Policy (Contracts and Sales); **Mr. P. L. de Laszlo** as director of Corporate Affairs; **Mr. W. M. Hurton** as director of Group Manufacturing Development; and **Mr. L. H. Short** as director of Overseas Operations.

* * *

Mr. Iain M. Stewart, B.Sc., chairman and managing director of Thermotank Ltd., and **Mr. John H. Lord,** C.A., a director of Dunlop Rubber Co. Ltd., have been elected to the board of G. & J. Weir Holdings Ltd.

* * *

The Central Electricity Generating Board announce the appointments of **Mr. E. M. Packham** F.C.C.S., as secretary, and **Mr. H. Marriott,** C.A., as accountant of the Eastern, London and South Eastern Region of the Board. Mr. Packham was appointed deputy divisional secretary, London Division, on April 1st, 1948, and held this appointment until December 1st, 1949, when he was appointed secretary of the same Division. Mr. Marriott was appointed divisional accountant of the South Eastern Division on March 1st, 1948.

* * *

Col. G. S. Marston, D.S.O., M.C., chairman of Lancashire Dynamo Holdings Limited, made a presentation recently on behalf of his fellow directors to **Mr. S. F. Steward,** C.B.E. Col. Marston stated that the presentation expressed the good wishes of the Lancashire Dynamo Group to Mr. Steward on taking up his new appointment as director-designate of B.E.A.M.A.

* * *

Metropolitan-Vickers Electrical Co. Ltd. announces the appointment of **Mr. A. D. Jacklin** as chief inspector, and of **Mr. W. H. Brodie** as assistant chief inspector. Both appointments are consequent upon the retirement of **Mr. H. Annis,** chief inspector.

Mr. H. W. Kirkby has been appointed a director of Thos. Firth and John Brown Limited. **Dr. F. W. Jones** has become a local director of the company and manager of the Brown Firth Research Laboratories. He succeeds **Mr. J. Woolman,** who has retired after 39 years in the company's service.

* * *

Mr. A. J. Gibbons, plant and equipment design engineer (transmission) of the Central Electricity Generating Board, relinquishing his duties with the Board to take up an important post outside the electricity supply industry.

* * *

Simmonds Aerocessories Limited, a member of the Firth Cleveland Group, announce the formation in Belgium, of Simmonds Aerocessories (Belgium) S.A. as a subsidiary company. The new company has offices at 25 rue Faider, Brussels. The manager of this company is **Mr. George Harms,** and the company will handle Simmonds self-locking nuts, spire speed nuts, and the products of Firth Cleveland Instruments Limited. The head office of Simmonds Aerocessories Limited is at Treforest, Pontypridd, Glamorgan, South Wales.

* * *

The Rubery Owen Group, who claims to be one of Britain's biggest industrial organisations, is to enter a new manufacturing field. It has formed a Rowen Arc Division to manufacture under licence in Britain, a revolutionary type of arc-welding equipment developed by the Westinghouse Electric Corporation of Buffalo, New York, and known in America as West-Ing-Arc.

* * *

The Ultrasonoscope Co. (London) Ltd., Sudbourne Road, Brixton Hill, London, S.W.2, announces that it has instituted a free technical service to advise on all aspects of ultrasonic flaw detection and inspection.

* * *

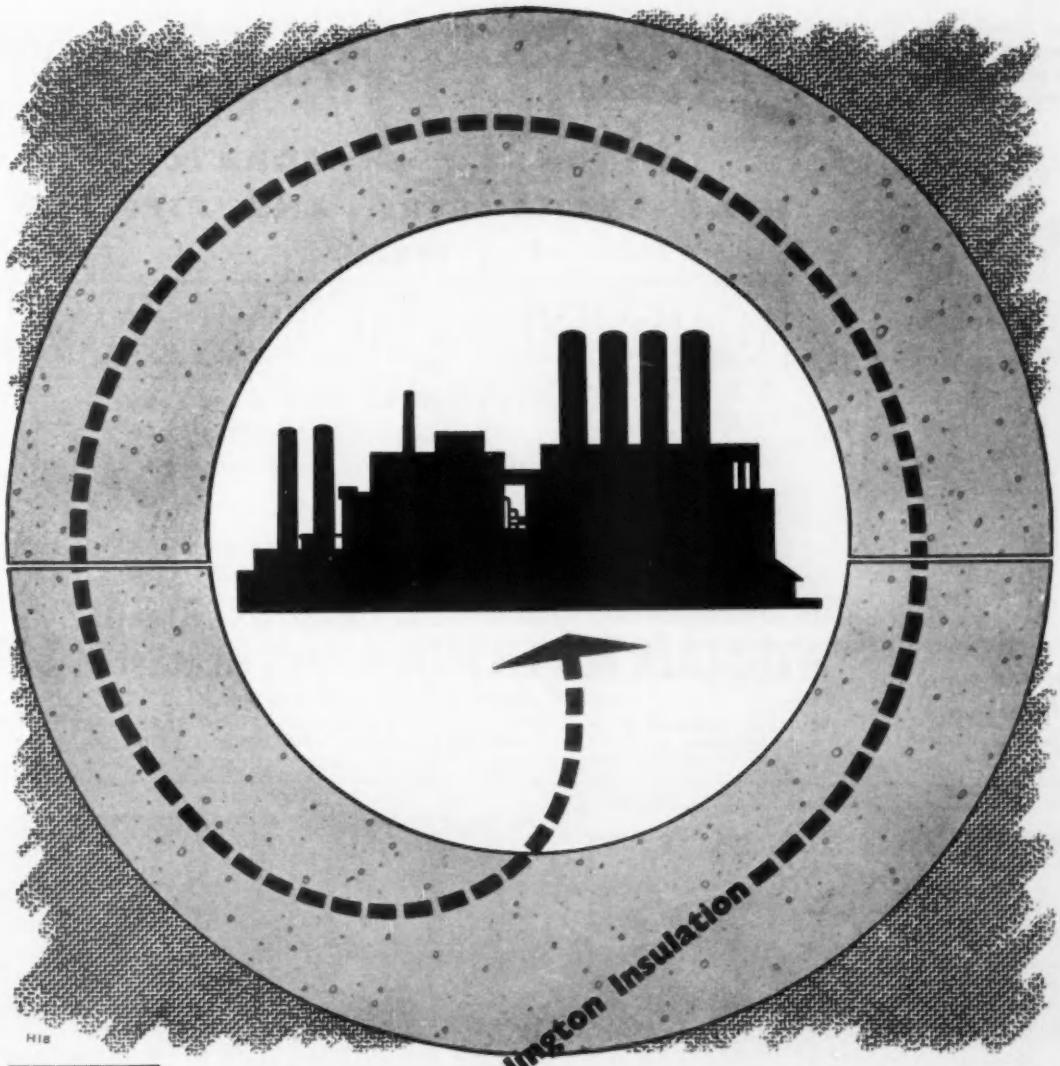
The engineering divisions of Geo. Salter & Co. Ltd., West Bromwich, covering the production of springs, retaining rings, bearings and castings, is now represented in the East Midlands by **Mr. Brian M. Morgan** and in the Southern Counties (north of the Thames) and E. Anglia, by **Mr. I. C. Stevenson.**

* * *

A new brochure published by **Bell's Asbestos and Engineering Limited,** Bestobell Works, Slough, Bucks., describes "Bestobell" sleeve-packed water gauges, which are available for steam pressures up to 300 lb./sq. in. Details are also included of the prismatic water-level indicators which are fitted as standard.

* * *

Mr. M. Hamshaw has been appointed managing director of Chemical Engineering Wiltons Limited.



HEAT & SOUND INSULATION EXHIBITION
EARLS COURT
APRIL 7—17, 1959
SEE OUR EXHIBIT

Year after year the Central Electricity Generating Board's list of power stations with the highest operating efficiencies includes a majority of stations where the efficiency is guarded by Darlington Insulation. In the 1957 list, for example, the top four stations are Darlington insulated.
Coincidence ? Not a bit of it ! Just skill and years of experience, plus careful specifications and the right materials.
It's The Darlington Insulation Company's job to help maintain high thermal efficiencies, and they do it very well.

THE DARLINGTON INSULATION CO. LTD

38 Great North Road, Newcastle upon Tyne, 2

and branch offices at London, Birmingham, Bolton, Bristol, Cardiff, Glasgow, Leicester and Sheffield.

A Member of The Darlington Group of Companies

See Stand H36
Factory Equipment
Exhibition, Earls Court,
London, 7-17th April

Prevent Scale and Corrosion

IN BOILERS, EVAPORATORS, HEAT EXCHANGERS AND PIPELINES WITH

CEPI-COMAV

These new MAGNETIC UNITS are fully automatic in operation, requiring no control, maintenance or replenishment.

FOR TREATMENT OF RAW WATER · SEA WATER · ACIDS · SUGAR & FRUIT JUICES AND MANY COMPLEX INDUSTRIAL FLUIDS.

Technical Advice and Literature from Dept. "B"

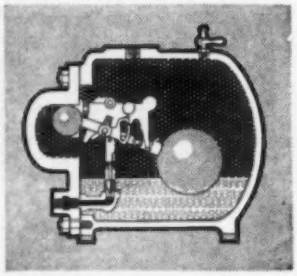
WILLIAM MATHWIN & SON (NEWCASTLE) LTD

U.K. Representatives and Distributors

190 WEST GEORGE ST., GLASGOW, C.2. | EXCHANGE BUILDINGS NEWCASTLE-ON-TYNE | 736 SALISBURY HOUSE, LONDON, E.C.2.

BRADFORD Steam Traps

open
and
close



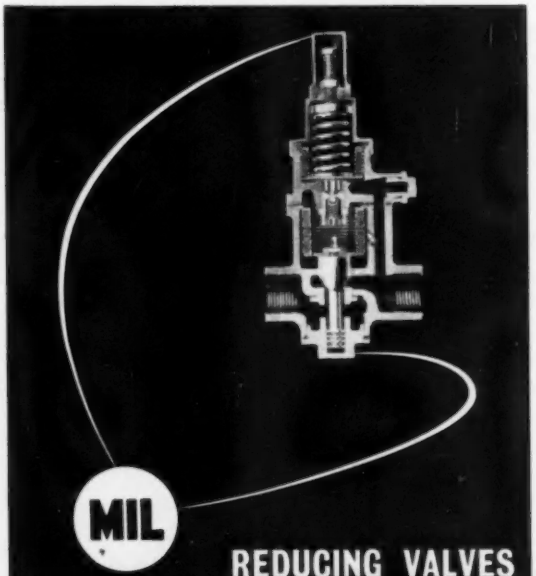
instantaneously

This instantaneous action distinguishes the Bradford Steam Trap from all its competitors. It prevents damage to valves and seats. It provides more efficient use of steam and heat, thus making an appreciable saving of fuel.

Made in all sizes for all pressures. Each Trap is individually tested and fully guaranteed.

UNITED STATES METALLIC PACKING COMPANY LIMITED
SOHO WORKS, BRADFORD 8, YORKSHIRE, ENGLAND
Tel. : 41284/5

Branch Offices : London, Liverpool, Glasgow, Manchester, Newcastle, Cardiff, Southampton, Hull, Swansea, and Bristol.



MIL

REDUCING VALVES

GUARANTEED FOR 2 YEARS

ALSO STEAM TRAPS, WATER HEATER CONTROLS, H.P. HOT WATER VALVES

MIDLAND INDUSTRIES LIMITED
HEATH TOWN WORKS · WOLVERHAMPTON. Phone: 23901

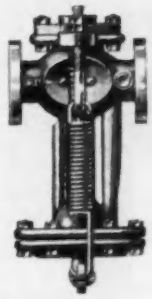
AULD

CLASS "A" TYPE

AULD'S PATENT REDUCING VALVES FOR ALL DUTIES ON STEAM, AIR OR WATER SERVICES

Also Manufacturers of :

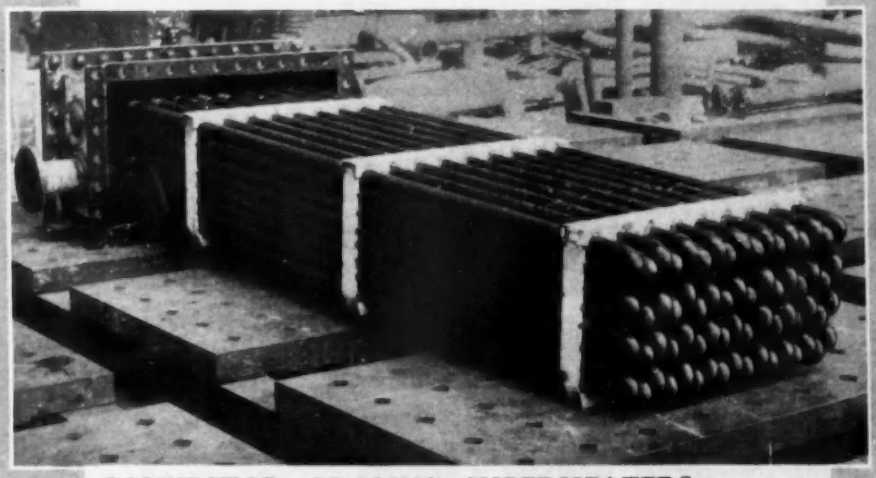
SURPLUS VALVES, COMBINED SURPLUS AND REDUCING VALVES, FULL BORE RELIEF VALVES, STOP VALVES, DE-SUPERHEATERS, STEAM TRAPS, etc., FOR ALL PRESSURES AND TEMPERATURES



QUITETITE TYPE

DAVID AULD & SONS Ltd., Whitevale Foundry, GLASGOW, S.E.

TELEGRAMS : "REDUCING," GLASGOW *TELEPHONE :* BRIDGETON 2124



CONVECTOR COOLING SUPERHEATERS

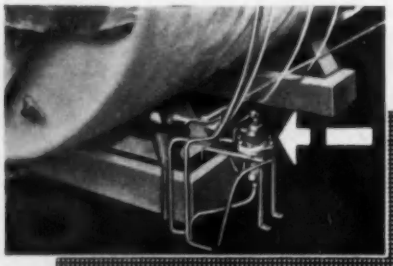
The illustration shows one of a number of superheaters supplied to Cynamid Products Ltd. Engineering Division, the business of which is now being carried on by Chemical Construction (Great Britain) Limited.

These superheaters, 7′ 3″ effective basis, 8′ 9″ overall basis, are fabricated from S & L ERW tubing.

Specialities: Pipework for high or low pressures suitable for steam, water, gas, etc., water wall headers, steam and oil receivers, de-superheater bodies. Tubular products of all descriptions for power stations and industrial steam raising plants.

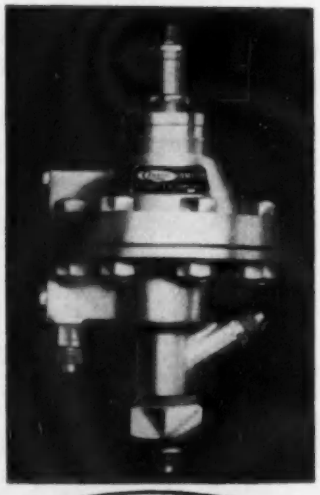
UNIT

THE **UNIT** SUPERHEATER AND PIPE CO. LTD · UNIT WORKS SWANSEA Telephone: Swansea 54031 (6 lines). Telegrams: 'Superunits', Swansea. Telex: 48-208



THIS IS ALL YOU NEED TO MAKE YOUR BOILER...

Self Clearing



The Carron-Smith Automatic Blow-Down Valve offers you a major advance in boiler maintenance technique. Delays due to the need for regular manual blow-down to maintain boiler efficiency are eliminated, and since the working of the valve is automatic, it requires no attention after installation. The Carron-Smith Automatic Blow-Down Valve has been fitted successfully on boiler plant by Ruston & Hornsby, Thermax, Cochran, Sinuflo, Spencer Bonecourt, Waste Heat and Lancashire, with highly satisfactory results. Write for your copy of the technical leaflet.

CARRON — SMITH

Automatic Blow-Down Valve

100 YEARS OF SERVICE

CARRON COMPANY
ENGINEERING DEPARTMENT
CARRON · FALKIRK · STIRLINGSHIRE

Showrooms and Sub-Offices : 15 Upper Thames Street, London, E.C.4. 22-26 Redcross Street, Liverpool, 1. 125 Buchanan Street, Glasgow, C.1. Sub-Office : 33 Bath Lane, Newcastle upon Tyne.

See what's new

Factory Equipment Exhibition

including
HEATING, VENTILATION
and INSULATION

Earls Court
London
April 7-17

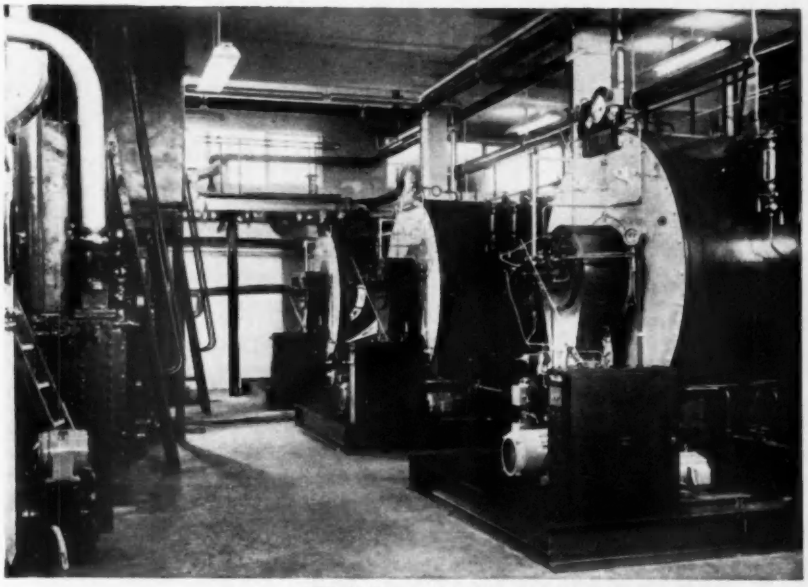
CLEAN AIR ACT

Among the hundreds of exhibits at this comprehensive exhibition will be methods of dealing with air pollution. Everyone faced with this problem should visit the exhibition. Special conferences on the Act and on Smoke Prevention will be held on Monday and Tuesday, April 13th and 14th. Details from The Organiser, 4 Snow Hill, London, E.C.4.

Daily 10 a.m. - 7 p.m.
(except Sunday).
Closes Friday 17th at 4 p.m.
Adm. 2/6

Alphabet of

"THE STEAMBLOC"



3 *STEAMBLOC MODEL 400 UNITS being part of a Steambloc Packaged Boiler installation supplied to the United Kingdom Atomic Energy Authority.*

Hundreds of "STEAMBLOC" fully automatic packaged boilers are giving satisfactory service at home and overseas to ADMINISTRATION COMMERCE and INDUSTRY

L — **LAUNDRIES · LABORATORIES**
LOCAL GOVERNMENT

M — **MOTORCARS · MUNICIPALITIES**
MARGARINE

N — **NUCLEAR ENERGY**

O — **OIL (REFINING & STORAGE)**
OFFICE HEATING · OXYGEN
OFFICE EQUIPMENT

SPENCER-BONECOURT-CLARKSON LTD.
28 EASTON STREET, LONDON, W.C.1. - Telephone: Terminus 7466 Telegrams: Heatecon, Phone, London.

THE DĒFUR PROCESS

Chemical Descaling by the " DEFUR " PROCESS is now of more importance than ever, especially in view of the extensive OIL CONVERSIONS now taking place. To ensure a perfectly scale-free Boiler, avail yourself of the DĒFUR free examination and report service. In other words:—

DON'T DEFER - DĒFUR

DĒFUR LTD. are specialists in CHEMICAL DESCALING of Boilers (all types) and ancillary Steam Plant, Process Plant, Water Mains, Gas & Marine Plant, etc.

SERVICE: Examinations, advice on all scale problems and firm quotations for descaling given.

SUPPLIES: DĒFUR DESCALING SOLUTION immediately available in CARBOYS or ROAD TANKERS.

DĒFUR DESCALING SERVICES LTD

2 ST. MARYCHURCH STREET
ROTHERHITHE, S.E.16
Telephone: BERmondsey 1321

LONDON · BRISTOL · MANCHESTER · SOUTHAMPTON

MEET THE REQUIREMENTS OF THE
CLEAN AIR ACT
Lock
SMOKE METER
& ALARM WILL
WARN YOU
Simple to install, it gives a continuous record of smoke density, sounding alarm automatically if smoke becomes excessive.
ASK FOR LITERATURE

A. M. LOCK & CO. LIMITED
PRUDENTIAL BUILDINGS, 79 UNION STREET, OLDHAM, LANCASHIRE
Telephone: MAin 6744 CW 3975/AM

So long as there's corrosion there'll always be APEXIOR REGISTERED

In all the changes of over fifty years, APEXIOR has been a sure shield against the costly ravages of corrosion. So it will remain. Whether the source of power be coal, oil or nuclear reaction, "APEXIOR NUMBER 1" will still ensure the most reliable protection for the internal surfaces of all steam-raising plant—wherever wet-heat temperatures between 170°—1000°F are encountered. "APEXIOR NUMBER 3" is equally trustworthy in cold-wet conditions up to 125°F and for the prevention of corrosion by galvanic action on the stern parts of ships.
Send for your copy of the Apexior Manual today.

DAMPNEY'S APEXIOR REGISTERED — ***SUREST SAFEGUARD AGAINST CORROSION***

"Apexior" is being used at Stations throughout the U.K. Atomic Energy Authority

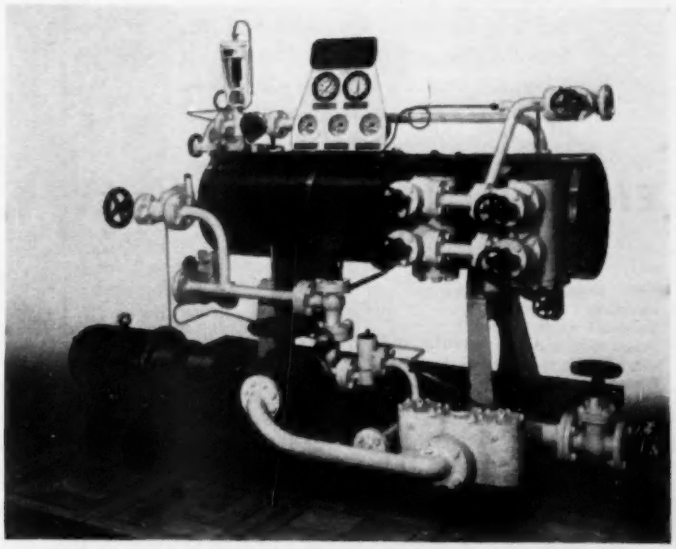
BRITISH PAINTS LIMITED *'Apexior' Division*
PORTLAND ROAD, NEWCASTLE UPON TYNE, 2
Crewe House, Curzon Street, London W.1 · 31, Wapping, Liverpool
OUR WORLD-WIDE SERVICE IS AT YOUR DISPOSAL FOR THE ASKING
SYDNEY · ADELAIDE · DURBAN · CAPE TOWN · CALCUTTA · TRINIDAD · NEW YORK

Visit the Great

ENGINEERING
MARINE
WELDING
& NUCLEAR
ENERGY
EXHIBITION

OLYMPIA LONDON
16th–30th APRIL 1959

STANDS
2 GRAND HALL
ROW F,
1 NATIONAL HALL
ROW Q.



The demand for Thornycroft Oil Fuel Burning Equipment for Industrial installations continues to increase.

The Simplex pattern Pumping and Heating Unit shown here is part of the installation in a new boiler house at London Airport.

For particulars of Industrial equipment write for publication SEB.99.

THORNYCROFT OIL FUEL BURNING EQUIPMENT

JOHN I. THORNYCROFT & CO. LIMITED, WOOLSTON WORKS, SOUTHAMPTON

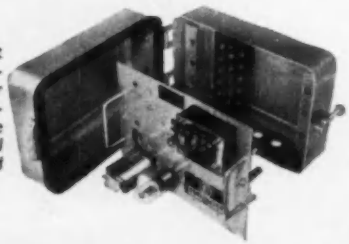
ELCONTROL

LEVEL CONTROL

Canute couldn't do it, but we can—been doing it for years now with straightforward electronics !
Elcontrol level controls for solids and fluids are reasonable, reliable, and practically ex stock.

Electronic Level Controllers

This standard relay unit embodies a readily withdrawable chassis ideal for installation and easy servicing. A wide variety of probe fittings enables most level control jobs to be effected satisfactorily.



Appointed Agents

MIDLANDS	A. M. Lock & Co. Ltd., Newborough Road, Solihull. *Phone: Shirley 5703*
N. WEST	A. M. Lock & Co. Ltd., Union Street, Oldham. *Phone: Main 6744*
SCOTLAND	A. R. Bolton & Co., 3A, St. Vincent Street, Edinburgh 3. *Phone: 32035*

ELCONTROL LIMITED
Wilbury Way, Hitchin, Herts.
Tel: Hitchin 2411

ACCURATE RECORDING INSTRUMENT CO.

MARINE
WELDING
EXHIBITION

STAND 3 ROW R

GROUND FLOOR
NATIONAL
HALL

ARIC

We welcome you to our Stand to see

A ventilation control panel for installation on mines pithead ventilation equipment.

A new liquid expansion recorder controller for the control of temperature giving a recording at the same time.

Working model of the ARIC gas thermostat showing the method of application and type of control.

The Central Electricity Generating Board type of temperature controller for use with mains transformer distribution equipment showing the method of control and application.

Displays of the ARIC range of pressure, vapour pressure and liquid expansion types of pressure gauges.

ACCURATE ARIC INSTRUMENTS

ARIC WORKS, WINDSOR AVENUE
MERTON, S.W.19 *Tel.: LIBerty 5661/2/3*

IRISH SUBSIDIARY:
ARIC (IRELAND) LTD., 6, MONTAGUE STREET, DUBLIN

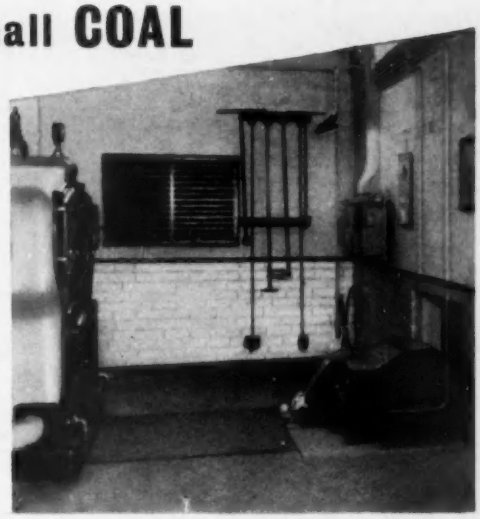
MAKE THE MOST OF small COAL

with PRIOR

UNDERFEED STOKERS

Take advantage of the millions of tons of small coal in ready and increasing supply which can be burnt smokelessly, with the minimum attention and the utmost economy.

Bunker flow and hopper model stokers, which include the DUPLEX type for the efficient combustion of low grade coals, are suitable for boiler and furnace applications. They are backed by the finest advisory and after sales service.



● Bunker Flow Stoker in a Government Building

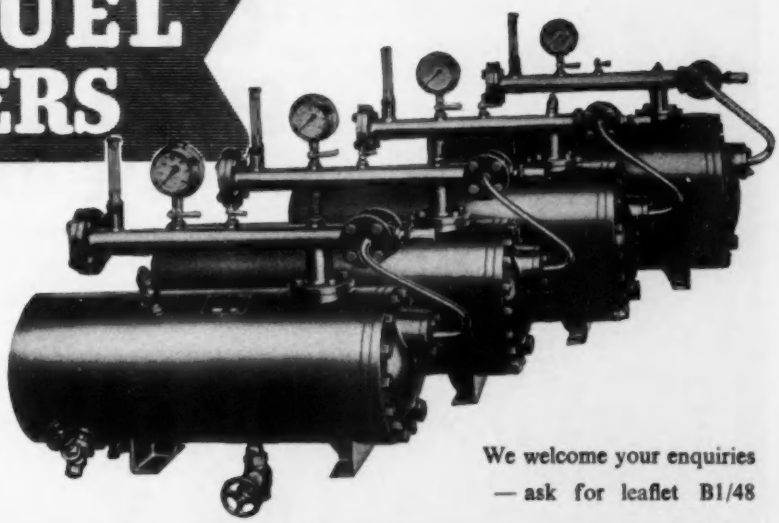
PRIOR STOKERS LTD

MAKERS of Oil Burners & Underfeed Stokers

1-3 BRANDON ROAD, LONDON, N7 TEL: NORTH 2245/8
50 WELLINGTON ST., GLASGOW, C2 TEL: CENTRAL 5323/4
and at BIRMINGHAM · BRISTOL · CARDIFF · LEEDS · MANCHESTER · NEWCASTLE · NOTTINGHAM

WPS—83

OIL FUEL HEATERS



by Caird & Rayner Ltd., for all grades of Fuel Oil and Creosote Pitch. Standard sizes to deal with 10 to 2,000 gallons per hour using Steam or High Pressure Hot Water as heating media.

We welcome your enquiries — ask for leaflet B1/48

Caird & Rayner LTD

777 COMMERCIAL ROAD, LONDON, E.14. TELEPHONE: EAST 3210 (5 lines) TELEGRAMS: "VAPORIZE LONDON

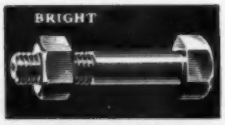
THE HOME OF Marwin

A modern factory, extending over 18 acres, fully equipped with an up-to-date plant for the production of the highest quality Bolts, Nuts, Studs, Sets and Special Parts in Bright Steel and in Heat Treated High Tensile Carbon and Alloy Steels for all industrial requirements. High temperature "Creep" resisting Studs, Bolts, Nuts, etc., are also manufactured.

All the above are produced in sizes ranging from ¼ in. to 3 in. dia. Larger sizes supplied to special requirements.

We also supply Bright Drawn, Heat Treated Carbon and Alloy Steel Bars in Hexagons, Squares and Rounds in all sizes up to 3½ in. dia.

Technical details and Catalogue on request.



W. MARTIN WINN LTD.

DARLASTON, SOUTH STAFFS

Telephone: JAMES BRIDGE 2072 (5 lines)

Telegrams: ACCURACY, DARLASTON

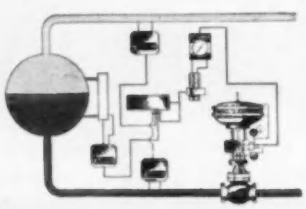
WATER LEVEL . . . . .

CONTROL PROBLEM ?

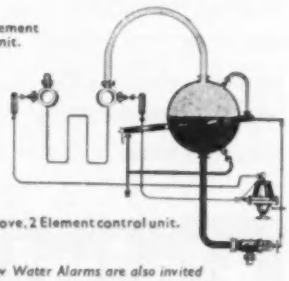
COPES HAVE THE ANSWER

Modern boiler conditions demand efficient control methods

Whether a two element feed water regulator or a three element regulator is chosen for high pressure boilers, Copes can offer suitable equipment with the background of over 35 years' experience gained in the field of feed and water level control problems.



Left, 3 Element control unit.



Above, 2 Element control unit.

Write for literature or ask for an Engineer to call.

COPES

Your enquiries for Desuperheaters and High and Low Water Alarms are also invited

COPES REGULATORS LTD

COPES REGULATORS LTD., 9, SOUTHAMPTON PLACE, LONDON, W.C.1. Telephone: CHANCERY 1975 Telegrams: COPEREG (Phone) LONDON

See our Exhibit at the ENGINEERING, MARINE, WELDING & NUCLEAR ENERGY EXHIBITION, STAND 23—OUTER ROW GALLERY, GRAND HALL, OLYMPIA, 16—30 April

A MECHANICAL STOKER that fully complies with the provisions of the 'Clean Air Act' . . .

SAVES ON COAL

BURNS INFERIOR FUEL

SAVES TIME & LABOUR

GIVES MORE STEAM

Evenly distributes fuel, keeps air spaces clinker-free by Self-Cleaning Fire Bars, ensuring complete combustion, eliminates smoke problems. Write for details *NOW!*

PROCTOR'S

MECHANICAL STOKER AND FAN-FORCED DRAUGHT *Equipment*

JAMES PROCTOR LIMITED, P.O BOX 19, HAMMERTON ST., BURNLEY. 'Phone Burnley 3102/3

PROCTOR'S COAL ELEVATORS complete the ideal installation

DANKS OF NETHERTON LTD.

Over a century of boiler making and engineering experience have gone into the manufacture of Danks patented SUPAPAK package boiler.

Principal advantages:

★ Treblepass Danks patented "Interflo" design boiler.

★ Fully automatic.

★ Accessibility top and bottom.

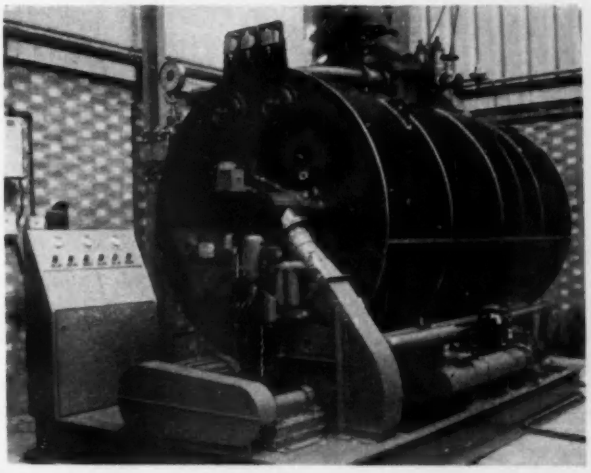
★ Over 80% efficiency.

★ CO_2 13½% to 14% over entire modulating range.

★ All welded construction up to 250 p.s.i.

Patent No. 736020.

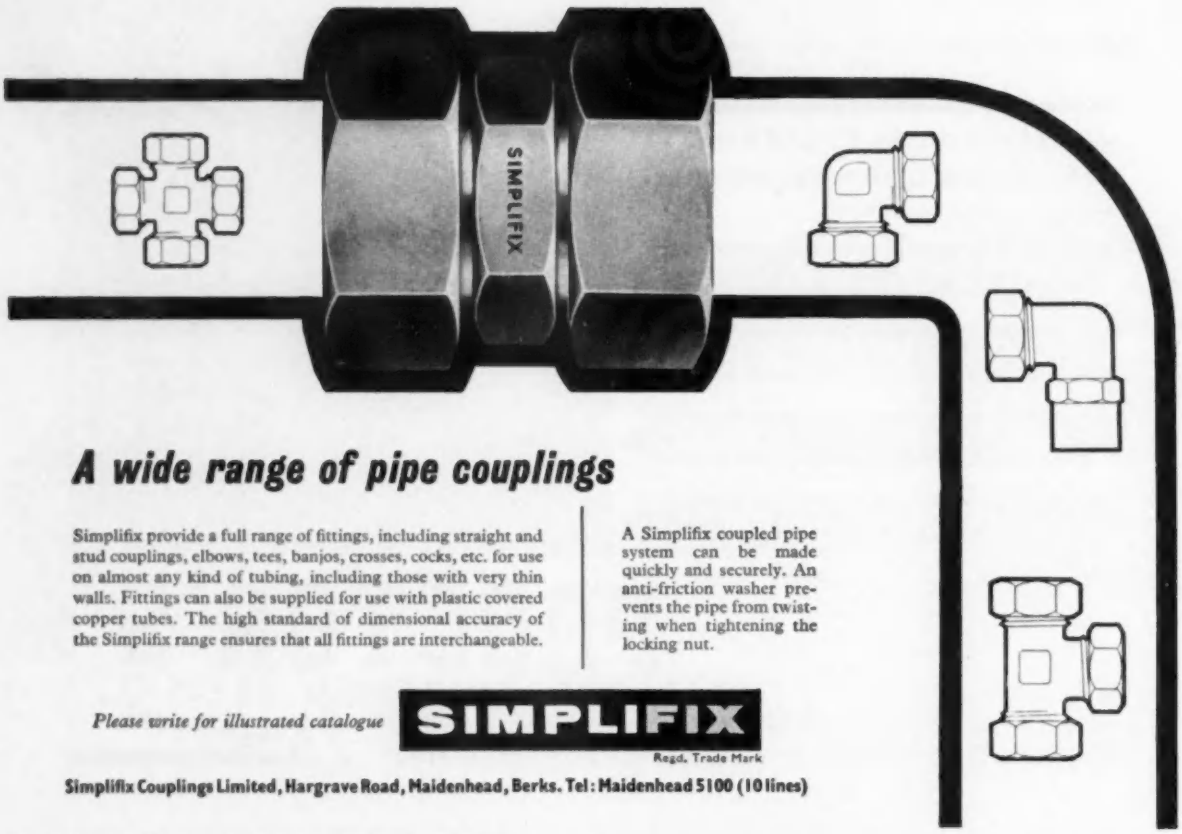
Brochure on application to



DANKS OF NETHERTON LTD.

Netherton, Dudley, Worcs.
Tel.: Cradley Heath 66417

London Office - Bank Chambers - High Holborn - W.C.1. - Holborn 2065



A wide range of pipe couplings

Simplifix provide a full range of fittings, including straight and stud couplings, elbows, tees, banjos, crosses, cocks, etc. for use on almost any kind of tubing, including those with very thin walls. Fittings can also be supplied for use with plastic covered copper tubes. The high standard of dimensional accuracy of the Simplifix range ensures that all fittings are interchangeable.

A Simplifix coupled pipe system can be made quickly and securely. An anti-friction washer prevents the pipe from twisting when tightening the locking nut.

Please write for illustrated catalogue

SIMPLIFIX

Regd. Trade Mark

Simplifix Couplings Limited, Hargrave Road, Maidenhead, Berks. Tel: Maidenhead 5100 (10 lines)

"HYSON" GAUGES

OVER A CENTURY OF EXPERIENCE IN

Instruments of Accuracy

PROMPT DELIVERY

to the requirements of:
ADMIRALTY
WAR OFFICE
AIR MINISTRY
B.O.T.
LLOYDS
BRITISH AND FOREIGN
RAILWAYS
AND OIL COMPANIES

SMITH BROS & CO (HYSON) LTD

HYSON GREEN VALVE WORKS · NOTTINGHAM · ENGLAND

Telephone: NOTTM 77134 Telegrams: "HYSON" NOTTM

"The Lancaster"

FORGED STEEL BELL TRAP

For pressures up to 1,000 P.S.I. & temperatures to 900 F. Three sizes ½", ¾" & 1"

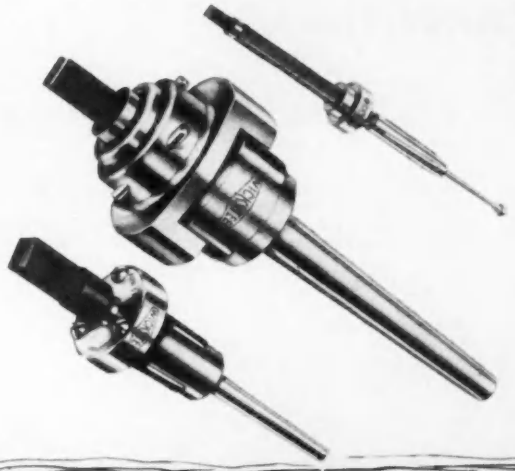
Send for details

We also manufacture Steam Traps for all purposes, Strainers, Gears & Blanks, Pumping Traps, Metallic Packings, Exhaust Heads, etc.

LANCASTER & TONGE LTD

PENDLETON · MANCHESTER · ENGLAND

Telephone: Pendleton 1484/5/6 · Telegrams: "Pistons, Manchester"

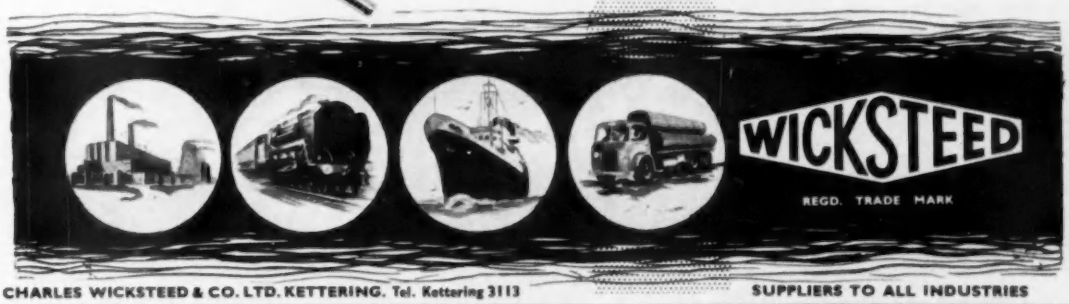


TUBE EXPANDERS

FOR ALL PURPOSES.

As supplied to the Admiralty, British Electrical Authority, Railways, Oil Refineries, leading Boiler Makers and Industrial users.

LEADING TUBE EXPANDER MANUFACTURERS FOR OVER 70 YEARS



CHARLES WICKSTEED & CO. LTD. KETTERING. Tel. Kettering 3113 SUPPLIERS TO ALL INDUSTRIES

"BROADY"

REDUCING VALVES

For STEAM, AIR, WATER, GAS and OIL

Manufactured in:—
GUN METAL
CAST IRON
CAST STEEL

A wide selection of valves for pressures up to 6,000 lbs./sq. ins.

"Your Problem is our Challenge"

WILLIAM BROADY & SON LTD.
ENGLISH STREET · HULL
Telephone: 29894 (5 Lines)

Index to Advertisers

	Page
Accurate Recording Instrument Co.	lxii
Albright & Wilson Ltd.	132 133
Allen, W. G., & Sons (Tipton) Ltd.	xvii
Auld, D., & Sons Ltd.	lvii
Automotive Products Co. Ltd.	ii
Babcock & Wilcox Ltd.	liv
Bouellat Eng. Co. Ltd.	xl
British Industrial Eng. Co. (Staffs.) Ltd.	xxxi
British Paints Ltd.	lxi
British Thomson-Houston Co. Ltd.	xii
British Vacuum Cleaner & Eng. Co. Ltd.	xliv
Broady, Wm., & Son Ltd.	lxvii
Caird & Rayner Ltd.	lxiii
Cape Asbestos Co. Ltd.	xi
Carron Company	lviii
Clarke, Chapman & Co. Ltd.	xxxii
Classified Advertisements	lxviii
Copes Regulators Ltd.	lxiv
Cory, Wm., & Son Ltd.	xvi
Crane Ltd.	x
Danfoss Manufacturing Company	lii
Danks, Edwin, & Co. (Oldbury) Ltd.	xxxvi
Danks of Netherton Ltd.	lxv
Darlington Insulation Co. Ltd.	lv
Defur Descaling Services Ltd.	lx
Dohm Ltd.	xlv
Elcontrol Ltd.	lxii
Electroflo Meters Co. Ltd.	Cover i
Factory Equipment Exhibition	lviii
Fluidrive Eng. Co. Ltd.	xiii
Green, E., & Son Ltd.	xxi
Hargreaves Ltd.	xlvi
Hayward Tyler Ltd.	xxii
Hick Hargreaves & Co. Ltd.	ix
Holmes, W. C., & Co. Ltd.	xx
Hopkinsons Ltd.	xliii
Howden, James, & Co. Ltd.	xxxv
Imperial Chemical Industries Ltd.	xxxiii
International Combustion Ltd.	xxiii
Ivor Power Specialty Co. Ltd.	vii
Judd Budd Ltd.	xlviii
Keith Blackman Ltd.	xxvi, lxx
K.S.B. Manufacturing Co. Ltd.	vi
Lafarge Aluminous Cement Co. Ltd.	xxx, xlii
La Mont Steam Generator Ltd.	iv
Lancaster & Tonge Ltd.	lxvi
Lock, A. M., & Co. Ltd.	lx
Marshall Sons & Co. Ltd.	xxxiv
Mathwin, Wm., & Son (Newcastle) Ltd.	lvi
Midland Heating & Ventilation Co. Ltd.	xviii
Midland Industries Ltd.	lvi
Newalls Insulation Co. Ltd.	xxxviii
Parsons, C. A., & Co. Ltd.	li
Permutit Co. Ltd.	iii
Prior Stokers Ltd.	lxiii
Proctor, J., Ltd.	lxv
Reavell & Co. Ltd.	xlviii
Simon-Carves Ltd.	xxix
Simplifix Couplings Ltd.	lxvi
Smith Bros. & Co. (Hyson) Ltd.	lxvi
Spencer-Bonecourt-Clarkson Ltd.	lix
Spirax-Sarco Ltd.	xxv
Stein, J. G., & Co. Ltd.	xxxvii
Stewarts & Lloyds Ltd.	xxxix
Sturtevant Engineering Co. Ltd.	xlix
Sulzer Bros. (London) Ltd.	xiv
Superheater Co. Ltd.	lxix
Swinney Brothers Ltd.	137
Teddington Aircraft Controls Ltd.	xxviii
Thompson, J., (Wilson Boilers) Ltd.	xxvii
Thornycroft, John I., Co. Ltd.	lxi
Turbine Furnace Co. Ltd.	xix
United States Metallic Packing Co. Ltd.	lvi
Unit Superheater & Pipe Co. Ltd.	lvii
Vokes Genspring Ltd.	xlvii
Wallsend Slipway & Eng. Co. Ltd.	xv
Walworth Ltd.	viii
Ward, Thos. W., Ltd.	l
Weir, G. & J., Ltd.	xli
Wicksteed, C., & Co. Ltd.	lxvii
Willcox, W. H., & Co. Ltd.	v
Winn, Martin, W., Ltd.	lxiv
Yarrow & Co. Ltd.	xxiv

CLASSIFIED ADVERTISEMENTS

VAUXHALL MOTORS

has a vacancy for a

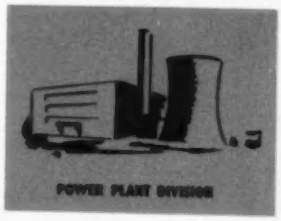
SHIFT ENGINEER

to supervise, on a rota basis with others, the operation and maintenance of the Boiler Houses and Producer Gas Plant. Good practical experience, backed by sound theoretical knowledge, and covering both coal and oil-fired boilers, is essential. Familiarity with diesel generating equipment would be an advantage.

Please write for an application form to—
STAFF EMPLOYMENT MANAGER,
Vauxhall Motors Ltd.,
Luton, Beds.

VALVES FOR SALE. Large quantity G.M. Steam Valve ¾ in. to 10 in. inspection invited.—H. POOLE & SON LTD., 21-27, Hunters Road, Hockley, Birmingham.

EXCEPTIONAL OPPORTUNITY for experienced Engineer as Deputy to General Manager of modern boiler and heavy engineering works in Calcutta. Applicants must be experienced and capable of taking complete charge of production planning and administrative duties relating to manufacture of engineering equipment which includes boilers, pressure vessels, chemical plant, sugar machinery, hydraulic sluice gates and equipment and rolling stocks. Excellent conditions and prospects including passages, provident fund, free furnished accommodation to the right person. Apply in duplicate with full details of experience and qualifications, age and salary required to—Box No. 269, ENGINEERING AND BOILER HOUSE REVIEW, 19-20, Noel Street, London, W.1.



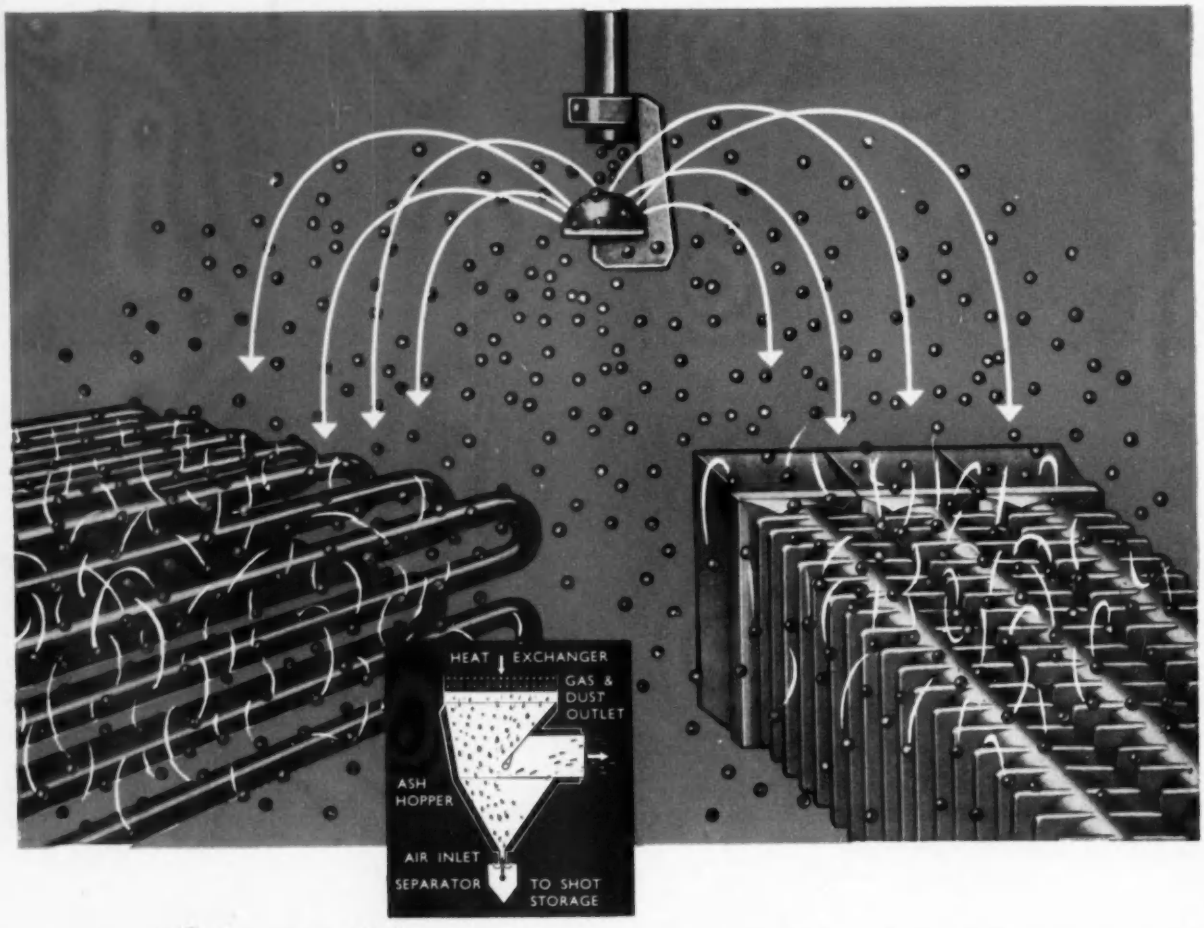
THE SUPERHEATER CO. LTD.

97, TOTTENHAM COURT ROAD, LONDON W1

MELESCO

THE AUTHORITY ON SUPERHEATED STEAM

MS/5.8



Shot Cleaning maintains constant temperature in heat exchangers at all times

GET MAXIMUM EFFICIENCY from new heat exchangers; recover lost power from old. Install the KEITH BLACKMAN-BROMAN EKSTROM SHOT CLEANING SYSTEM which, irrespective of fuel (coal, oil, waste heat, sulphite, sulphate liquor or creosote pitch), offers many indisputable advantages:

SHOT CLEANING maintains continuously, constant temperature in the boiler, economiser or preheater—by dislodging deposits from heat transfer surfaces *before* thermal efficiency or boiler draught is affected.

SHOT CLEANING acts with the boiler under full load —no shut down, no dampering back. It ensures plant availability all the time—requires no outages for cleaning.

SHOT CLEANING is a dry cleaning method—no steam, no air, no water is introduced to affect the dew point of gases, as in conventional methods.

SHOT CLEANING permits the installation of the right size heat exchanger—no need now for the larger than necessary plant which allows for gradual decline in efficiency.

SHOT CLEANING has proved its effectiveness in POWER STATIONS, GAS WORKS, FOUNDRIES and other INDUSTRIAL PLANTS throughout the world including Europe, U.S.A., Canada, U.S.S.R., Japan and India. Your enquiry benefits from the experience gained from the installation of hundreds of such plants.

IN BRIEF Shot cascades evenly over the cross-sectional area of the tubes. It ricochets from tube to tube, plain or gilled, dispersing undesirable deposits before they can accumulate. The shot is pneumatically recirculated just as long as is necessary to keep heating surfaces clean—generally about 20 minutes during any 8 hour shift. Simplicity of the system is reflected in the extremely low operating and maintenance costs. Installation costs too are often far less than with conventional cleaning methods.

KEITH BLACKMAN - BROMAN EKSTROM *Shot Cleaning*
PROMOTES MAXIMUM HEAT TRANSFER

Write now for descriptive Publication 35/10

Keith Blackman Ltd MILL MEAD ROAD · LONDON · N.17
Incorporating Blackman Export Co. Ltd.
and at Birmingham · Bristol · Glasgow · Leeds · Leicester · Manchester · Newcastle-on-Tyne

Proprietors and Publishers: Engineering Review Publishing Co. Ltd., Registered Offices, 19-20, Noel Street, London, W.1
Printed by Electrical Press Ltd., at Cordwallis Works, Maidenhead, Berks.
Registered for transmission by Magazine Post to Canada including Newfoundland.